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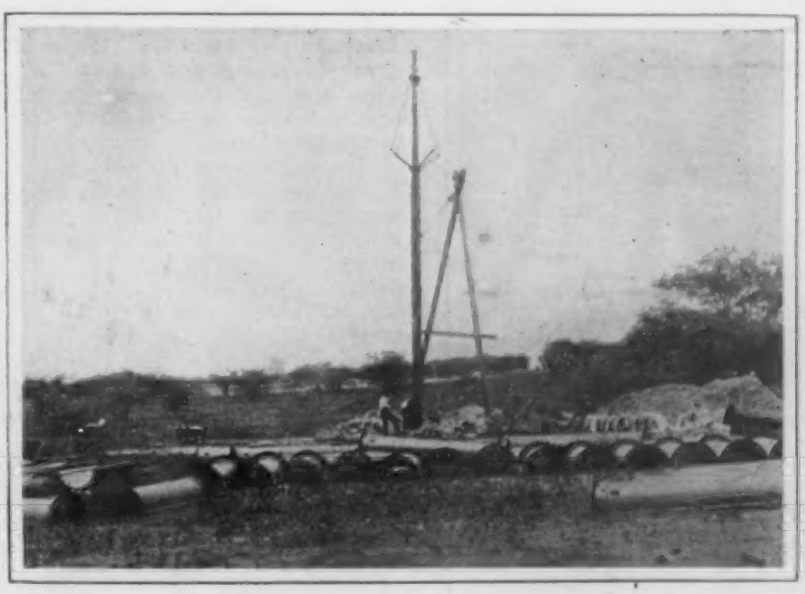
Wireless Telegraph Transmission Towers

Design and Erection of the Lofty Sectional Steel Poles for a Globe Circuit of 3000-Mile Transmission Stations

BY JAMES STEDMAN

The Marconi Company is now engaged in the work of establishing a permanent wireless circuit of the earth. When the powerful stations now under construction or now about to be constructed are completed, it will be possible to start a message from any one of the number and send it step by step around to its starting point. The steps will be few in number—in fact, only seven or eight. There may be a change of location in the case of one or two of the stations; but for the present their locations may be assumed as follows: London, New Jersey, San Francisco, Honolulu, Yokohama, India, Egypt. The procedure will be to transmit without relay from station to station, thus requiring a transmission capacity of about 3000 miles at an average station.



Shear Leg Raising the Wooden Topmast Preparatory to Placing the First Steel Sections Marconi High Power Wireless Station at Honolulu

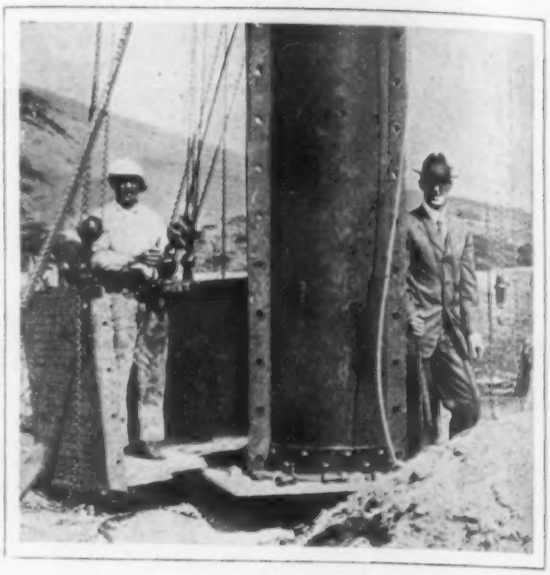
It is understood that the transmitting apparatus concerned in the world circuit will not be engaged in local business or any activity other than the sending and receiving of messages to and from the next station on the east and the next on the west. Each station will be duplex in arrangement. That is, there will be a transmitting portion separate and distinct from a receiving portion, and so located with respect to each other that reception and transmission can be carried on at the same time. For example, the New Jersey station connecting with London is divided into a transmitting installation near New Brunswick on the banks of the Raritan River and a receiving installation near Belmar at the head of Shark River and near the Atlantic coast. These installations are about 30 miles apart as the crow flies, and the line joining them extends approximately northwest and southeast. The transmitting wires or antennæ will be directed parallel with the great circle of the earth passing through London and the New Jersey location. This, of course, gives the shortest distance between the stations. Now this direction at the New Jersey station is approximately northeast and southwest. That is, the transmitting and receiving installations are placed on a line at right angles to the antennæ stretching out in the direction of London. There is a purpose in this. The location of the receiving wires or aerials is thus the very best possible to avoid disturbance from the energy sent out in the direction of London from the transmitting antennæ. The same object of small disturbance is sought also in the selection of diverse wave lengths for transmission from London and from New Jersey. The receiving apparatus in New Jersey is necessarily adjusted to the London wave length, which makes it ill adapted to receive from the nearby transmitting apparatus.

The incoming messages will be automatically photographed on a sensitized paper strip. By this means, the receiving office will have a correct and permanent record. Transmission is to be carried out automatically at the rate of 60 to 80 words per minute. Despite the fact that the two parts of the New Jersey station are located about 30 miles apart, the transmission and reception of messages will be taken care of at the receiving point. A telegraphic line will connect the transmission apparatus, so that by means of an automatic relay it will be possible to operate the high-power transmission keys from a distance.

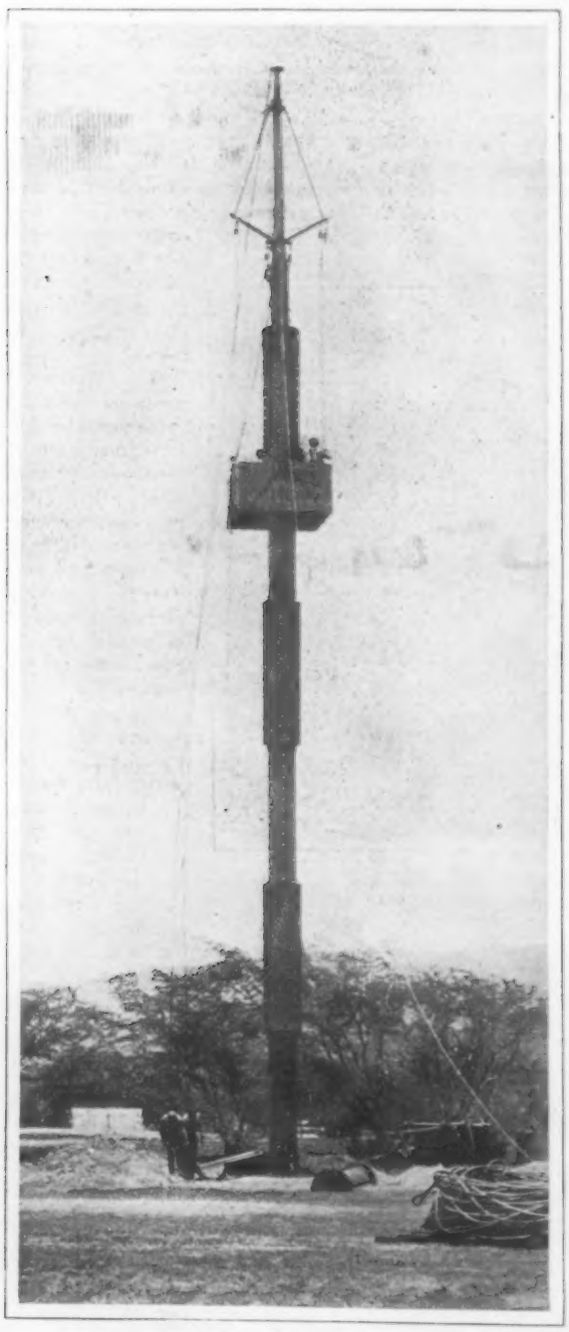
In carrying out the long-distance transmissions and receptions, great towers become a necessary feature. The aerials are strung for considerable distances at rather high elevations. Thus the New Brunswick transmitting aerials will be strung upon a line of towers 13 in number and each 435 ft. in height. The wires will be of silicobronze. At Honolulu the towers belonging to the aerials transmitting to Yokohama will be 14 in number and each will be 480 ft. high. When it is remembered that each station will have duplex installations, both for the eastern neighbor and also for the western one, it will readily be seen that the number of towers involved in the world circuit will be quite considerable.

The towers or masts which support the aerials consist in the main of composite hollow steel cylinders. Those at the bottom are built up of quarter sections and sometimes of half sections flanged vertically and secured together to make short-length tubes. These short lengths are bolted together, horizontal flanges being provided for the purpose. However, a diaphragm or plate is interposed between lengths. The first length is bolted to a heavy plate which has previously been carefully leveled and secured to a concrete block. The block or pier of concrete may be 8 ft. thick and 10 x 10 ft. in horizontal section. The erection of the first one or two cylinders is of course no difficult matter and needs no special methods.

As the tower or mast goes on up, the problem becomes important. The solution is most interesting. A wooden erecting mast is employed to support the hoisting arms or booms. The mast stands enveloped by the upper part of the partially erected tower. That is, it passes through square holes cut in the diaphragms which separate the horizontal flanges of the short lengths of cylinders. Near its bottom, it is supported by a removable pin which passes through the walls of the tower and the body of the wooden mast. The hoisting arms are four in number. From their outer ends depend chain hoists which carry the weight of a square wooden cage. This cage is used by workmen employed in erecting the tower, and may be lowered and raised by them without leaving it. The material hoisting arrangements serve to lift to position the parts of the next cylinder that is to be attached.



Base of Mast at Koko Head, Honolulu, Showing Half of the Working Cage



The Mast in Course of Construction

When one section of the tubular mast is finally in place, the next thing is to get the mast to a new position, one cylinder higher up. This is done as follows: A heavy but flexible steel rope is secured to the top of the unfinished steel mast. It is then carried down inside the tube along a groove arranged on one side of the wooden mast, down to a sheave arranged near the bottom of it, and then up a second groove to the top of the tower. Here the rope is passed over a second sheave temporarily attached to the uppermost cylinder and then carried to a snatch block at foot of the mast and thence to a winch. Upon removing the pin and operating the winch, the wooden mast is raised. After this operation, the temporary sheave, together with the rope, is removed.

The stay wires which maintain the tower in its vertical position are attached as opportunity offers during erection. Over two miles of 1-in. plow steel wire rope are required for the proper staying of one of the high towers. An interesting precaution has to be taken in connection with these ropes in view of the possibility that electric vibrations may be set up in them of such a character as to have a period in harmony with the wave period of the sending apparatus. To guard against such corespondence in period, it has been deemed necessary or advisable to break up the guy ropes into short sections. Porcelain insulators are employed at the joints. These have a tensional strength of 75,000 lb.

It is quite important that the elastic extension of the guy ropes shall be as small as possible. Even a moderate stretch might result in a vibration of the tower in a strong wind and the setting up of severe strains upon the stays. To guard against difficulties arising out of elastic extension, it has been determined that no splicing of ropes shall be permitted. Consequently, connections at the tower, at the insulators and at the anchorages are all required to be made with specially designed bridge sockets.

There are four anchorages per tower for the attachment of guy ropes. These are located on a circle having a radius of 200 ft. and consist of heavy blocks of concrete in each of which a crib-work of steel has been embedded. A strap of steel projects out of the concrete for each stay rope. In order to take up any slack and to develop the proper tension in the rope, strong turnbuckles are employed.

As before remarked, the cylinders are made up of sections secured together along vertical flanges. For the 400-ft. masts the lower 16 have a diameter of 42 in. and a height of 15 ft. each. The fifteen cylinders next above are each only 10 ft. in length and have a diameter of 30 in. We thus get a tower 400 ft. high. A 30-ft. top mast brings the total height up to 430 ft. The larger cylinders have four vertical joints each. The others consist of two sections each.

Making of Gray Iron Motor Car Castings*

Effect of Steel Scrap—Influence of the Structure of Various Pig Irons on the Properties of the Castings

BY H. B. SWAN

The subject of cast iron as related to motor cars covers a much wider field than the scope of this paper will permit. Cast iron and steel are the materials which are by far the most extensively used in the mechanical parts of the car, although malleable iron does enter into consideration to no small extent. Such a vast amount of research work has been done on steel that the selection of a composition chemically and physically most suitable for the kind of service demanded of it is no longer a matter of guesswork. Perhaps not to the same degree but still vastly important is the selection of the proper composition of metal most suitable to meet the duties required of the parts made from cast iron.

Fig. 1

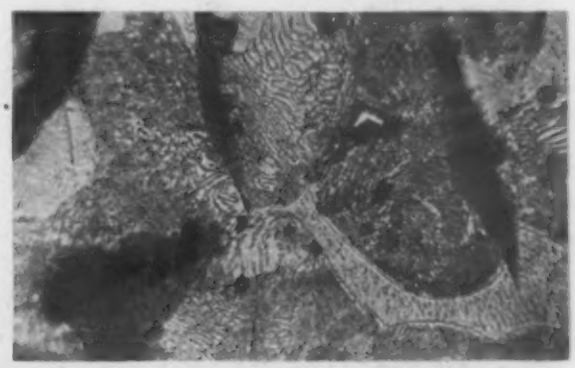


Fig. 2

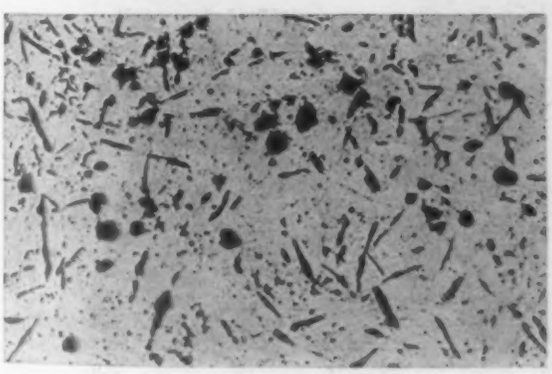


Fig. 3

Fig. 4

Photomicrographs of Pig Iron, Figs. 1 and 2, of 50 and 1000 Diameters Respectively, Representing Iron No. 1; and Figs. 3 and 4, of 50 and 1000 Diameters Respectively, Showing Iron No. 2

The building of motor cars has become a science and the automobile engineer demands castings of a maximum strength with a minimum of weight. The design of the part may be of such intricacy as to produce conditions which tend to cause defective castings. He further specifies that the castings shall conform within limits to a certain chemical composition and be free from the numerous characteristic foundry defects. Moreover, the machine shop demands that they shall cut readily. This does not necessarily mean that the castings shall be soft, although metal too hard or having hard spots is bad for machining. In the opinion of the writer there is a discrimination between hardness and cutting qualities, judged from the standpoint of the life of the tool.

Effect of Crystalline Structure on Properties

It is the practice in the foundry with which the writer is associated [at Detroit] to pour several test bars of each kind of iron daily. These test bars are ½ in. square and represent to a fair degree a section of the castings made, and are used in connection with Keeps' test. After being broken for transverse strength they are ground to a smooth surface and tested with a Brinell machine for hardness. It has therefore been a matter of careful observation and interest to note that while the chemical composition and hardness as represented by these daily test bars may vary to but a slight extent, cutting qualities of the iron seem to fluctuate materially. As a usual thing the amount of combined carbon present gives a good indication of the hardness of the metal, but inasmuch as experience has shown us that the metal may be hard to machine, that is, hard on the tools even when the combined carbon is present only in a normal amount or less, it seems that there must be other factors to consider. Is it not possible then that the crystalline structure may have something to do with the machinability of the metal?

Since the machine shop operations are usually on a piecework or premium system, the importance of keeping the quality of the metal uniform is readily understood, for if the metal is hard uniformly or has hard spots, or, as said above, is hard on the tools, it means a slowing up of production and a loss of both time and money to the manufacturer and the foundryman.

Casting Automobile Cylinders

Let us consider some of the motor parts made from gray iron. For many reasons the cylinder has been most widely discussed. Often it is of a very complex design. It may be cast as a single unit with or without a water jacket. Twin cylinders are common and three, four and even six en bloc are met with frequently. Of late it has

*A paper read at the convention of the American Foundrymen's Association, Chicago, October 14 to 17.

come into practice to cast the cylinders en bloc integral with the engine base and even more complex designs are not uncommon. Under such conditions very light sections join with those comparatively heavy and it is not an easy matter to select an iron of a composition that will run well, be sound and free from spongy spots, leaks, etc., and meet other requirements. Another matter to consider is the wearing qualities of the iron. This is something which as yet seems to have been given little study and attention. Some work has been done in Europe in connection with bronzes with the aid of a machine especially designed for this purpose. It would seem, for instance, that it would be not only interesting, but of value, to know more about the relation between the cylinder and the piston ring in connection with their wearing qualities, hardness and chemical composition. The laboratory of the company by whom the writer is employed has recently purchased a machine from Europe for the study of these conditions and it is hoped that information of considerable value will be obtained.

It may be readily seen that a cylinder iron may, depending on conditions, possess characteristics entirely at variance from those suitable for a flywheel. If the flywheel rim is to be cut with gear teeth its properties may closely approach those of a cylinder in that it should be sound, strong, and possess good wearing qualities. For piston rings we have found that the best results are obtained with an iron high in phosphorus and low in manganese. This iron has the spring-like quality desirable for this part and is not too brittle to stand the test demanded of it, provided the phosphorus does not run higher than about 1.15 per cent. Its hardness depends upon the hardness of the cylinder in which it is to run; that is, it should be a few points higher on the Brinell scale than that of the cylinder, for it must stand more wear. Engine bases and transmission cases should be strong and more ductile than other castings, for usually when made in cast iron they are made as light in section as is allowable, and with the rapid cooling around dry sand cores, internal strains are often set up which may not develop into cracks which are noticeable until subject to the vibration of the motor and the jolts of the car. This may be remedied by the choice of a proper composition of metal not too high in phosphorus and by the use of charcoal iron.

The Use of Steel Scrap

It is almost general practice among automobile foundries to use varying percentages of steel scrap in their mixtures, running from 10 to 40 per cent. Authorities generally state that the strength increases with the addition of the steel up to the latter amount. This is undoubtedly true if the chemical composition be regulated accordingly, but it has been found in our class of work requiring hot, fluid iron, that the silicon and phosphorus have to be increased to such an extent that the increase in strength is discounted. The increase of these metalloids seems likewise to be deleterious to the machining qualities and softness, and the high amount of steel tends to increase the chilling qualities of the iron to a prohibitive extent when used in connection with the amount of scrap iron necessary for economical production. Turner states that best machining qualities and softness are obtained with a silicon content of about 2.5 per cent., although the maximum tensile and transverse strength are reached between 1.75 and 2 per cent. It has been found that a silicon content of 2.5 per cent. with manganese 0.60 to 0.70 per cent. and phosphorus about 0.50 per cent. gives a very good iron in every respect for lighter castings. For cylinders and pistons the introduction of 10 to 15 per cent. steel and lowering the silicon content to 2.15-2.25 per cent. increases the strength materially. For flywheels and heavier work which is not machined at a high speed rate

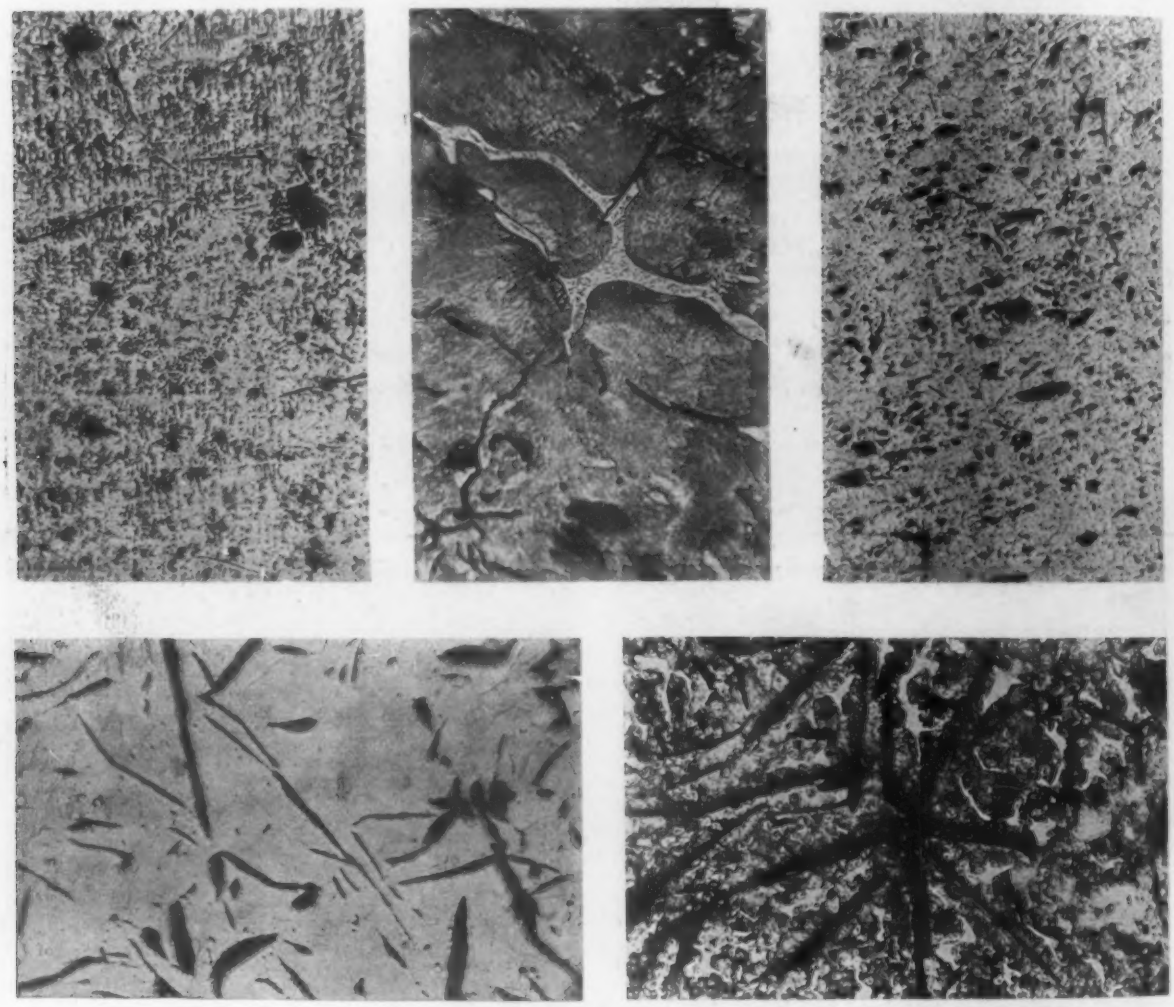


Fig. 5 Fig. 6 Fig. 7 Fig. 8 Fig. 9

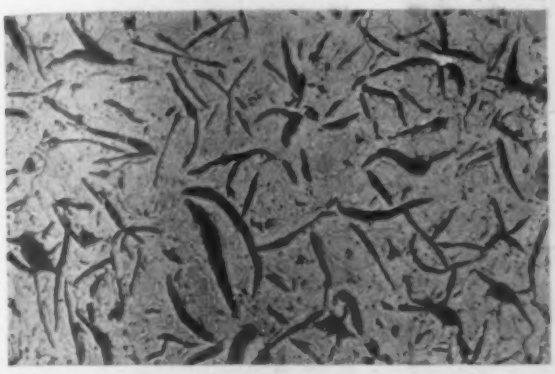
Photomicrographs of Pig Iron, Figs. 5 and 6, of 50 and 1000 Diameters Respectively, Showing Iron No. 3; Fig. 7, of 100 Diameters, Representing Iron No. 4, and Figs. 8 and 9, Both of 100 Diameters, Showing Iron No. 5

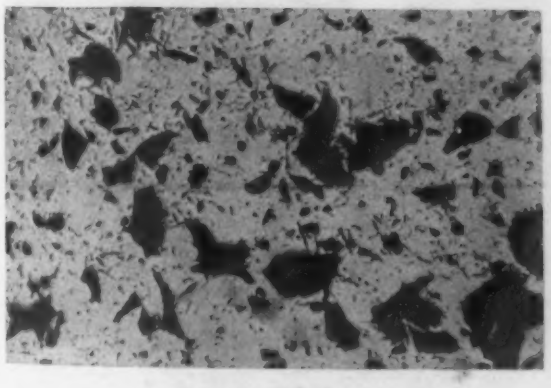
of cutting, steel is increased from 20 to 25 per cent. and the silicon lowered to between 1.8 and 2 per cent. This gives a very strong iron which is also very suitable for gear teeth.

It seems important then that a grade of metal best adapted to meet the requirements of service be chosen for the type of casting to be made. Of course it is not necessary or practical to run heats of a composition especially designed for each of the numerous castings for motor cars, but it is practical and economical in the long run to divide the different types into classes, three or four in a number, and pour them with the metal best suited to fill the conditions, both from the foundry standpoint and from that of the metallurgist.

As a whole, automobile castings are classed as light work, but, as said before, much of it is intricate work; light and heavy sections adjoining and often with heavy bosses attached. It is not always practical or convenient to use chills, and if these castings could be poured with iron poured, and from each pig iron used in the mixture, photomicrographs were made from the test bars and from sections of the pigs.

It has doubtless been the experience of many foundrymen to note that, in spite of all consideration and care in mixing and melting of iron, the metal produced will oftentimes give results absolutely at variance with what might be expected and irons of duplicate analyses may give very different physical results. The question then arises whether or not characteristics peculiar to one brand of pig iron can persist in the final product after mixing with others and going through the cupola. This did not seem probable to the writer, yet results obtained in practice seem to make such a theory tenable, for we found that the addition of 15 per cent. of one brand of iron to a mixture increased the strength of the product about 10 per cent., although the analyses of the two products were very close. Likewise the addition of this iron decreased the shrinkage, increased the softness and made the cutting





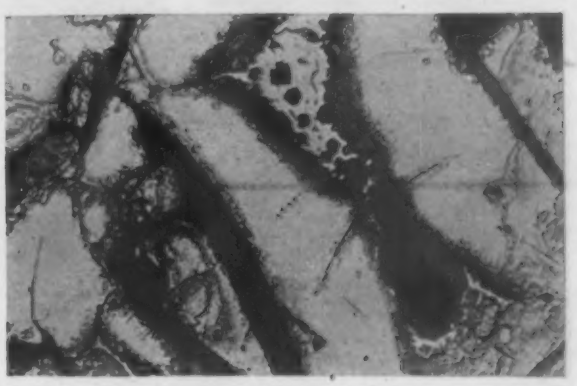


Fig. 10 Fig. 11
Fig. 12 Fig. 13

Photomicrographs of Pig Iron, Figs. 10 and 11, of 50 and 1000 Diameers Respectively, Showing Iron No. 6; and Figs. 12 and 13, of 50 and 500 Diameters, Respectively, Representing Iron No. 7.

an iron which would be close-grained and free from draws, sponginess, and segregation under these conditions of design and still meet the requirements of wearing well and having good cutting qualities, a very desirable point would be obtained. Of course there are numerous other important factors to consider which will aid in the production of such an iron, such as the manner of gating the castings. For instance, a piston cast with the bosses solid is much less liable to be spongy if gated about the circumference but between the bosses. Again, a small change in the design will do much toward obtaining the desired result.

Scope of the Experimental Work

It was in order to gain some insight into the vagaries and inconsistencies of cast iron and to correlate, if possible, the chemical composition and rate of cooling with the physical properties such as strength, hardness, resistance to wear and machinability, that a line of experimental work dealing with different brands of pig iron and varying percentages of steel was undertaken. It seems reasonable to suppose that the crystalline structure of the metals as well as chemical composition is linked with some of these properties. Therefore, in each experimental heat of qualities very much better; it was decided then that there was a possibility of developing the quality of the iron through a study of the pig iron.

Predominating Pearlitic Structure the Best

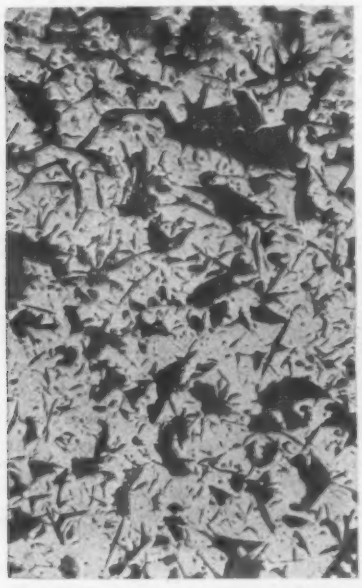
Through this study and by means of experimenting with various mixtures, it is hoped that a better iron will be produced to meet the requirements of motor car castings. Theoretically, an iron with a pearlitic structure predominating to the greatest possible extent and the excess carbon in the amorphous or temper form would seem to be most desirable. When, however, one considers the large number of variable factors which may influence the structure of the iron, the scope of the problem to be studied can be realized.

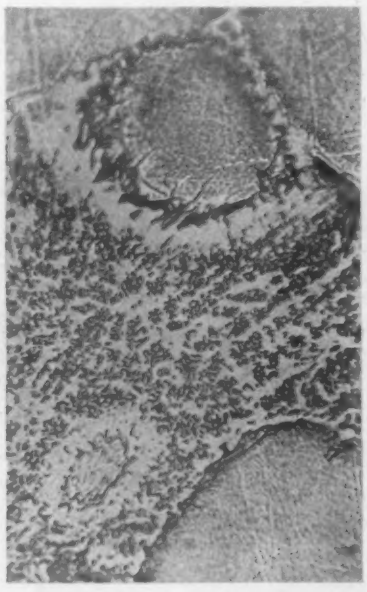
We have not as yet done sufficient work to feel warranted in drawing any definite conclusions. While the value of the work undertaken is still speculative, Table 2 is presented for whatever interest it may have to the foundryman, showing in a condensed form the results obtained from mixing the various irons of Table 1. Table 3 gives some data on the various irons used by the writer for the different classes of automobile work.

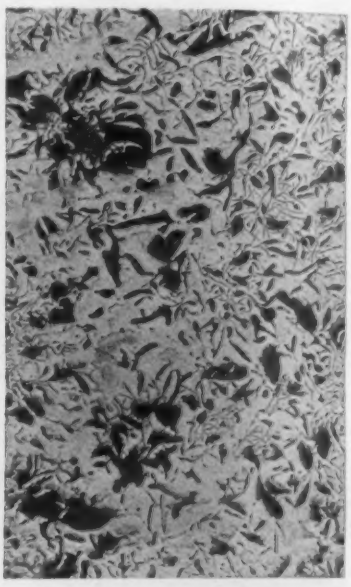
For ascertaining the soundness of the metal, four cast-

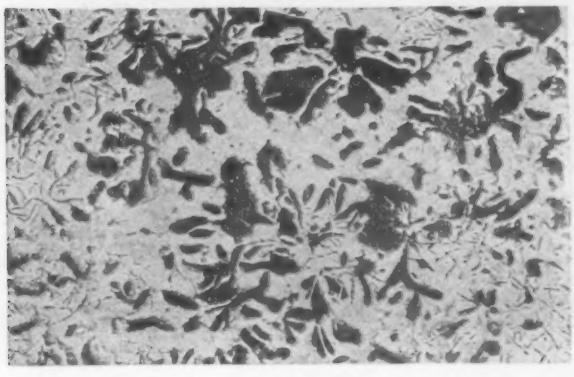
ings of a large single cylinder were poured from each heat. The barrel of the cylinder being light in section, with the outside circled by a heavy flange having a large boss on the cope side, presents excellent conditions for spongy metal. Column under "Remarks" shows whether the castings were sound or spongy.

Table 1 is a compilation of different brands of pig iron used by the foundry with which the writer is associated and shows the various chemical compositions. Iron No. 1 is a Northern charcoal brand. Nos. 2 and 5 are Virginia irons; Nos. 3, 4 and 7 are Northern coke irons; No. 6 is a Southern iron; No. 8 a silvery iron; No. 9 is a Cuban iron of special composition, containing, in addition to the elements usually met with, chromium and nickel and traces of vanadium and titanium. Nos. 10 and 11 are charcoal irons from the New England states.









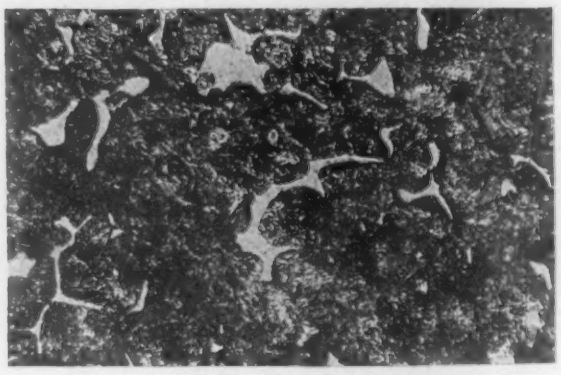


Fig. 14 Fig. 17 Fig. 15 Fig. 16 Fig. 18

Photomicrographs of Pig and Cast Iron, Figs. 14 and 15, of 50 and 1000 Diameters Respectively, Showing Iron No. 8; Fig. 16, 50 diameters, Iron No. 10; and Fig. 17, 50 Diameters, Iron No. 11. Fig. 18, 500 Diameters, Shows Section of Test Bar from Heat 14, Table 2

Discussion of Photomicrographs

The space allowable for a paper of this kind precludes the showing of more than a limited number of the photomicrographs obtained—something over 200 having been taken. Fig. 1 is a photomicrograph of the No. 1 iron, the sample being polished and magnified 50 diameters. The rosette-like structure of the graphite is to be particularly noticed, as this is peculiar to this charcoal brand. A close inspection also reveals the presence of the iron-carbide eutectic, but in relatively small amounts.

Fig. 2 shows the same sample etched and magnified to 1000 diameters. This plate shows in fine detail the structure of the various micrographic constituents, ferrite, pearlite, graphite and eutectic of the iron carbon system sometimes called Ledeburite.

Fig. 3 shows iron No. 2, a Virginia iron, polished and magnified 50 diameters. This sample was taken from a longitudinal section of a sand-cast pig. The short, straight crystals of graphite and the greater predominance of the eutectic constituent is to be noticed in contrast with the charcoal iron of Fig. 1, although both the combined and total carbon contents are very nearly the same for both irons.

Fig. 4 shows the same iron, with the sample etched and magnified 1000 diameters. Here we also have in clear detail the constituents ferrite, pearlite, graphite, and, very clearly outlined in the center of the plate, the eutectic.

Fig. 5 presents a still different structure of graphite; a combination of the short, straight crystals and irregular masses and also what may be called the "pine tree" or

Table 1

No. of iron	C. C., per cent.	G. C., per cent.	Total C., per cent.	Mn., per cent.	P., per cent.	S., per cent.	Si., per cent.
1	0.50	3.06	3.56	0.55	0.114	0.022	1.99
2	0.53	3.12	3.65	1.15	0.399	0.044	2.17
3	0.53	2.97	3.50	0.72	0.230	0.018	3.18
4	0.38	2.84	3.22	0.90	0.531	0.013	3.42
5	0.63	2.67	3.30	1.12	0.951	0.019	2.65
6	0.60	2.40	3.00	0.33	1.405	0.047	1.63
7	0.41	3.01	3.42	0.54	0.736	0.025	2.47
8	0.00	2.16	2.16	0.87	0.443	0.041	8.88
9*	3.63	0.55	4.18	1.18	0.044	0.001	0.49
10	Trace	3.52	3.52	0.42	0.409	0.027	2.53
11	0.32	3.07	3.39	0.21	0.404	0.038	1.41

*No. 9 also contains 1.05 per cent. nickel and 2.17 per cent. chromium.

Table 3

Class of iron	Piston ring	Cylinder	Flywheel	Soft
Combined carbon	0.60-0.70	0.50 -0.60	0.60 -0.70	0.30 -0.40
Graphitic carbon	2.40 2.75	2.25 -2.80	2.25 -2.60	2.75 -3.25
Manganese	0.25-0.35	0.65 -0.75	0.60 -0.75	0.60 -0.75
Phosphorus	1.00-1.15	0.40 -0.45	0.40 -0.45	0.45 -0.55
Sulphur	0.08-0.10	0.075-0.095	0.075-0.095	0.075-0.095
Silicon	1.80-2.00	2.10 -2.25	1.80 -2.10	2.40 -2.60
Tensile strength	29,190	35,780	37,400	27,020
Transverse strength	2,680	3,710	3,500	2,720
Shrinkage	150-160	155-160	160-165	148-154
Depth of chill	10-20	10-20	0.15-0.25	0.000-10
Brinell hardness	228-235	207-212	212-217	174-187
Per cent. steel in mixture	0-10	10-15	20	None
Per cent. scrap in mixture	50-60	50-55	45-50	50-60

dendritic crystallites formed during solidification. It is also to be noted that as the percentage of impurities increases the structure becomes more complex. This sample is taken from a cross-section of a machine-cast pig and shows the effects of the rapid cooling of iron cast in this way.

Fig. 6 shows a portion of the dendrite magnified to 1000 diameters. Some of the original ribs of the eutectic are shown and also some of the pseudomorphic graphite derived from the decomposition of the cementite in the same.

Fig. 7 shows a sample of iron No. 4 polished and magnified to 100 diameters, taken from a machine-cast pig. This iron is made from the same ores as iron No. 3, although the furnaces are not located in the same cities. The analyses are not widely different, yet the structure is, the graphite being in more coarse and irregular areas.

Fig. 8 is a sample of iron No. 5, magnified to 100 diameters; a sand-cast pig of a Virginia brand. While the silicon content is much less than in the preceding two irons and the total carbon about the same, yet the structure of the graphite is in very large crystals.

Fig. 9 shows the same iron etched and magnified to 100 diameters. Here we have a star-like formation of the graphite with pearlite surrounding the same and "Steadite," the phosphide eutectic, in relief.

Fig. 10 is a sample of iron No. 6 polished and magnified 50 times. The phosphorus content being high and the combined carbon also rather high, we have the "Steadite" constituent to a marked extent.

Fig. 11 shows the same sample magnified to 1000 diameters and etched. Here the detail is shown: graphite, ferrite, pearlite and Steadite.

Fig. 12; this is a sample of iron No. 7, polished and magnified to 50 diameters. The same brand as iron No. 3, but sand cast and taken from the edge of the pig. The slower cooling is evidenced in the coarse graphite crystals.

Fig. 13 shows the same sample as Fig. 12, but etched and magnified to 500 diameters. Here is shown in the center of the photomicrograph a partially decomposed area of Steadite and bordering it finely divided graphite, a decomposed product from cementite.

Fig. 14 shows sample of iron No. 8, a high silicon or silvery iron polished and etched to 50 diameters. Graphite is very abundant, with no evidences of the eutectic constituents. This plate is taken from the edge of a sand-cast pig.

Fig. 15 shows the same iron etched and magnified to 1000 diameters; detail of silico-carbide area very clearly shown.

Fig. 16 is taken from a sample of iron No. 10. This plate shows a section taken from the outside of a pig. This is a charcoal brand of iron, but from a section of the country very remote from iron No. 1. By referring to Fig. 1 it will be noticed that there is a similarity of structure between the two irons, although the percentage of metalloid in iron No. 10 is larger than in iron No. 1. This photomicrograph is at a magnification of 50 diameters and is simply polished without etching.

Fig. 17 is a sample from iron No. 11; the same brand as iron No. 10, although the percentage of silicon is over 1 per cent. lower. This sample is at the same magnification as Fig. 16 and likewise taken from the edge of the pig.

Fig. 18 is taken from a section of a test bar from heat No. 14 of Table 2. The pearlitic structure predominates here. This is a very good iron, close grained, tough and all castings poured from it were sound.

In conclusion it may be said that during the coming year we hope to do more work along this line and that more definite data will be secured, which will be of practical value.

TABLE 2.

Heat No.	Per cent Charged: Iron No. 1.	Iron No. 2.	Iron No. 3.	Iron No. 4.	Iron No. 5.	Iron No. 6.	Iron No. 7.	Iron No. 8.	Iron No. 9.	Hard scrap.	Soft scrap.	Steel scrap.	Ferromanganese, lb.	Combined carbon.	Graphitic carbon.	Manganese.	Phosphorus.	Sulphur.	Silicon.	Shrinkage.	Depth of chill, in.	Brinell hardness.	Tensile strength, lb per sq. in.	Transverse strength 1 in. bar.	Remarks.
1	33	...	...	...	56	...	...	...	...	...	...	10	...	0.58	2.91	0.61	0.60	0.093	1.83	0.159 0.163	0.18 0.23	217	29,800	450	Metal in boss of castings spongy. Machine well.
2	23	...	...	...	26	...	...	16	...	...	...	33	3	0.59	2.37	0.80	0.459	0.105	1.90	0.169 0.164	0.26 0.23	228	32,766	485	Grain of metal very close and fine. Castings all sound.
3	33	...	...	53	...	...	...	5	...	...	...	10	1	0.61	2.88	0.53	0.593	0.096	1.81	0.164 0.155	0.20 0.19	212	31,583	445	Castings about same as No. 1.
4	33	...	...	56	...	...	...	...	...	...	...	10	2	0.64	2.16	0.47	0.364	0.050	1.94	.....	.....	...	22,708	....	Castings badly spongy.
5	21	...	...	25	...	...	...	20	...	...	...	33	5	0.62	2.44	0.85	0.504	0.112	1.89	0.173 0.166	0.30 0.50	235	30,600	460	Grain of metal close. All castings sound.
6	21	...	...	26	...	...	...	18	...	...	...	33	3	0.71	2.00	0.44	0.333	0.115	1.86	.....	.....	...	36,500	....	Grain not so close as No. 5, but all castings sound. One cylinder misrun.
7	...	...	50	...	...	...	...	16	...	...	...	33	2	0.58	2.44	0.69	0.551	0.100	2.45	0.168 0.162	0.18 0.16	235	32,400	455	Grain fairly close on 3 castings; 1 spongy.
8	...	...	25	...	...	...	...	18	...	23	...	33	2	0.54	2.41	0.54	0.483	0.121	2.49	0.169 0.164	0.24 0.19	235	32,400	480	Grain close. All castings sound, but 2 cold shut.
9	...	...	25	...	...	...	...	18	...	23	...	33	3	0.64	1.98	0.54	0.515	0.140	2.00	.....	.....	...	35,650	....	One casting sound; 2 with small spongy spots; 1 badly spongy.
10	25	...	...	...	...	...	...	18	...	...	23	33	3	0.55	2.32	0.53	0.462	0.110	2.48	0.169 0.164	0.22 0.22	235	.....	450	One casting sound; 2 slightly spongy 1 badly spongy.
11	25	...	...	...	...	...	...	20	...	...	21	33	3	0.62	2.25	0.62	0.356	0.105	2.78	.....	.....	...	37,550	....	Grain close and fine. All castings sound.
12	...	...	...	...	28	...	...	16	...	...	21	33	1	0.60	2.42	0.47	0.63	0.115	2.27	0.168 0.163	0.28 0.30	235	32,733	445	One casting good; 3 spongy.
13	...	25	...	...	...	...	...	16	...	25	...	33	...	0.60	2.22	0.46	0.535	0.111	2.53	0.168 0.171	0.28 0.29	235	37,760	480	These castings had bad spongy areas; 1 badly spongy.
14	43	...	...	...	...	...	...	23	...	...	...	33	3	0.57	2.47	0.55	0.293	0.105	2.39	0.165 0.162	0.18 0.10	217	32,000	500	Necessary to enlarge gates to run well; 3 castings misrun. Heat re-run; all castings sound; grain close and fine
15	...	...	...	...	...	58	...	8	...	...	...	33	...	1.40	2.44	0.23	0.962	0.131	1.99	0.191 0.180	All chill	255	32,130	385	Castings all good. Grain very light gray.
*16	...	...	46	...	...	...	...	3	13	...	36	...	2	0.55	2.98	0.44	0.452	0.087	2.18	0.195 0.157	0.09 0.06	205	24,100	455	Grain open. All castings with large spongy spots.
17	30	...	...	...	...	...	...	15	...	...	25	30	...	0.49	2.54	0.62	0.319	0.093	2.12	0.166 0.166	.....	215	.....	450	All castings good; grain close; machine well.
18	30	...	...	...	...	...	...	17	...	...	22	30	3	0.55	2.40	0.69	0.34	0.089	2.29	0.166 0.160	0.30 0.08	210	.....	450	Grain close; castings good. Machined fair, some hard spots; tendency to chill.
19	30	...	...	...	...	...	...	18	...	...	21	30	3	0.43	2.52	0.63	0.312	0.081	2.23	0.169 0.160	0.36 0.26	200	.....	480	Grain good; all castings good. Machine poorly; hard spots; tendency to chill.
20	30	...	...	...	...	...	...	30	...	...	...	40	3	0.57	2.44	0.48	0.581	0.100	2.76	0.154 0.160	0.18 0.26	212	.....	425	Grain good, but metal tough and machines poorly.
21	23	...	...	...	...	...	...	36	...	...	...	40	3	0.46	2.41	0.48	0.651	0.113	2.87	0.154 0.152	0.22 0.13	207	34,120	445	Grain good; too hard and tough for machining well.

*Nickel 0.20 per cent.; chromium 0.46 per cent.

An American standard for dimensions for brass flanges was adopted on September 17 by the Committee of Manufacturers on Standardization of Fittings and Valves, effective January 1, 1914, and a copy of the pamphlet giving the tables of the dimensions can probably be obtained by addressing W. H. Douglas, secretary of the committee, 30 Church street, New York City.

A Helicoidal Impeller Centrifugal Pump*

A New Type with a High Suction Lift—Tests to Determine Maximum Efficiency

BY C. V. KERR†

The development of a new type of centrifugal pump, especially for low-pressure volume service, which will run at speeds to bring out the best economy of the steam

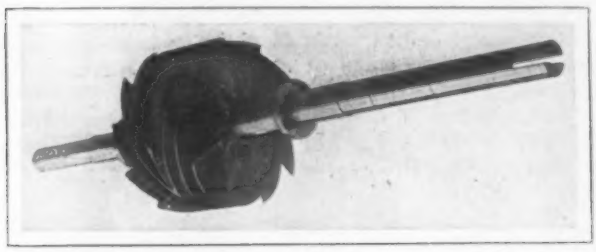


Fig. 1—A 10-Blade Impeller Having a Helix of 20 Deg.

turbine, and therefore of the unit, has been attempted. As part of that purpose a machine which is of the same superior construction and running qualities as the steam turbine has been kept in mind.

In view of the avowed purpose of these pumps to work with condensers as circulating and hot-well pumps, and with steam turbines as the motive power, an 8-in. pump with a speed of about 3000 r.p.m., a total head of from 30 ft. to 40 ft., and a maximum efficiency near 1200 gal. per min. was designed. Provision for getting the results of various combinations of impellers and annular nozzles was provided. The first effort at designing, patternmaking, casting and machining gave an efficiency of only 33 per cent.

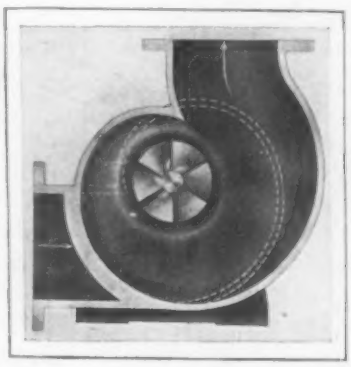


Fig. 2—Typical Section of a Pump Casing

With a double suction impeller, having six right-hand and six left-hand blades making an angle of 15 deg. with the plane of rotation and a diameter of 6½ in. for this 8-in. pump a test was made. A pressure regulator of the spring-loaded type was used to control the speed of the turbine to secure constant head. For the head of 31 to 34 ft. the speed began at 3600 r.p.m. and ran down to shut-off at 2000 r.p.m. For a head of 21 to 24 ft., the speed began at 2850 r.p.m. and ran down to shut-off at 1625 r.p.m.

By throttling the suction the capacity of the pump to lift water was indicated. The elevation of Wellsville is about 1500 ft. above sea level, and normal barometer stands about 28.3 in. At a speed of 3700 r.p.m. and discharge head of 10 ft., with a small amount of discharge from the pump and the barometer standing at 28.05 in., the vacuum maintained by the pump, as measured by mercury column referred to the center of the shaft, on one test was 26.9 in. This corresponds to a lift of 30.4 ft. against a limit of 31.7 ft. fixed by the barometer. On another test with a different runner, with barometer standing at 28.1 in. and speed of 3500 r.p.m., the vacuum was maintained in the suction of the pump at 27.0 in., which means a lift of 30.5 ft. against a limit of 31.8 ft. fixed by the barometer. At 3040 r.p.m., the vacuum in the pump suction was maintained at 26.2 in. The highest vacuum reached could be steadily maintained at speeds as high as 4000 r.p.m.

Apparently justified by the results on the 8-in. experimental pump, a pump of this type with the maximum capacity of 30,000 gal. at 45 ft. total head for service as a circulating pump with a large condenser was built. A photograph of the impeller is shown in Fig. 1. This is one of three different impellers having different numbers of blades and helix angles that were built and tested with this pump. In this case the runner has 10 blades with the helix angle of 20 deg. The other runners were of 5 and 8 blades with helix angles of 20 deg. and 17½ deg. respectively.

Three nozzles of different sizes and form were used. In this case a coefficient of 0.97 was used which is thought to be sufficiently conservative. Three sizes of pitot tube were also tried but the 5/16-in. tip was used as giving the best combination of sensitiveness and steadiness of water column. The static water column was used to check the pitot tube readings and when both were in proper working order and due allowances were made for connections and velocity heads, the agreement between the two sets of readings was very close. The advantage of the static water column as a safeguard was repeatedly shown during the tests. Occasionally a small piece of shaving or fiber of some kind would lodge on the tip of the pitot tube and lower its water column to such an extent as to require immediate attention. This condition which might not otherwise have been noted quickly was always shown at once by comparison with the static water column.

Upon the basis of information obtained from such tests as the foregoing, and from observation of running qualities, a series of pumps was designed. A typical section is shown in Fig. 2. An effort was made to mold the interior of the pump casing so that the water would change velocity and direction smoothly and with a minimum of eddy losses. The best position, however, of the cut-off is an uncertain matter. The intention is so to locate it that throughout the range of change in direction of water discharged from the impeller, there will be no eddy losses occasioned by the direction of stream lines crossing the cut-off. In the dotted lines, the general form of the volute suction inlet is shown. The edges of the blades can be spaced and machined accurately and water can be taken into the impeller from the hub to the rim.

In Fig. 3 the elevation is partly shown in section. The feature strongly emphasized in the design of this pump is the ability to withdraw the impeller and shaft endwise from the casing simply by removing one bearing head. As compared with the split casing type of pump, this construction permits the suction and discharge to be located at any direction required by circumstances. Also, it frequently happens, as in the basement of a power plant or in cramped quarters on shipboard, that crane service is not available. This would make it difficult to remove the top half of a casing, while two men can handle the shaft and impeller even of a 30-in. pump of this type. The throat rings are of bronze; the sleeves on the shaft are locked right and left to hold the bronze impeller in any desired position and to prevent rusting of the shaft by the fluid pumped. The water discharged from the pump is used to seal the glands and prevent air drawing into the suction passage. The bearings are ring oiling with split babbitt-lined bearing shells. The design of the impeller permits balancing, which is practically perfect, both at rest and

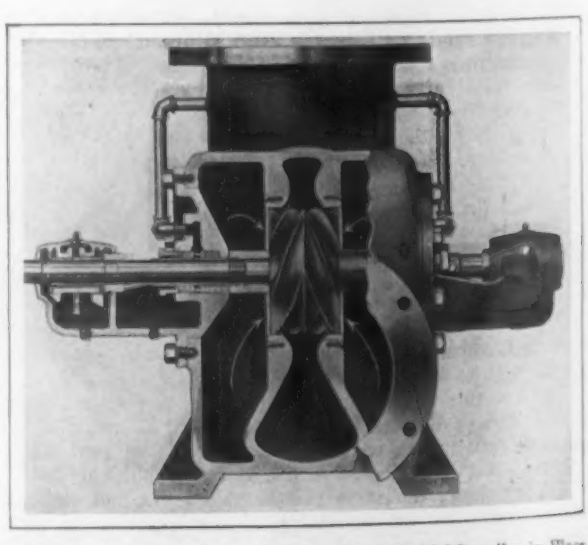


Fig. 3—Section of the Pump Showing the Helicoidal Impeller in Place

*From a paper printed in the October Journal of the American Society of Mechanical Engineers.

†Formerly chief engineer, McEwen Bros., Wellsville, N. Y.

running. This balance is not destroyed by the stresses set up by rapid rotation. The result has been that in the pumps so far constructed, the bearings ran with even less tremor or vibration than the bearings of the turbine used to drive them.

With the ordinary centrifugal impeller, change of capacity at a given head and speed is obtained by width of discharge opening; in the helicoidal, the helix angle may be changed, greater capacity resulting from a greater angle. Change of head at a given speed and capacity may be obtained from the centrifugal impeller by change of blade angle at discharge or of diameter; but in the helicoidal, by notching, and if the relations of helix angle and depth of notch are suitable, the efficiency is increased by notching. Leakage back into suction is reduced by the screw conveyor effect of a short cylindrical portion at either side revolving within the throat rings.

With the same axial inlet velocity assumed, the helicoidal impeller lies within the eye or inlet opening of the centrifugal. Then by notching deep with small helix angles, relatively low head and large volume may be obtained with good speed and efficiency.

Economy in Photographing

BY N. G. NEAR

Many manufacturers have no advertising department and have nobody in their employ who is thoroughly familiar with the various steps necessary to exploit properly the products they manufacture. This is especially true of the photographing, retouching and engraving steps, where much money is needlessly wasted through poor supervision and insufficient knowledge. Even if one of the men higher up is familiar with those steps, he often finds his mind distracted by other things to the extent that the advertising is permitted to go through almost "any old way."

Many details are connected with working up a presentable halftone which may aggregate a very expensive amount if the advertising supervision grows indifferent. One of the most important details is the photograph, which should be as clean-cut as possible. That a clean-cut photograph is a necessity should be self-evident to one with absolutely no knowledge of cuts, yet time and again I have seen such poor examples of photographic art presented to the artist for "brushing up" that I feel it my duty to write about photographs in terms of dollars and cents in order to make my appeal thoroughly understood.

A photograph was recently turned over to me that was so obscure that only those persons familiar with the machine could readily identify it. The retoucher had no end of trouble in making a good representation of it. He and I worked over it for nearly a week comparing parts with similar machines, examining blue prints and consulting the company's engineers. At the end of that time the president declared the retouched photograph to be a "fine work of art." The retoucher's bill was $40. Besides, much of my time and the engineer's time was lost that could have been spent to better advantage in furthering the company's interests had the photograph been clear in the first place.

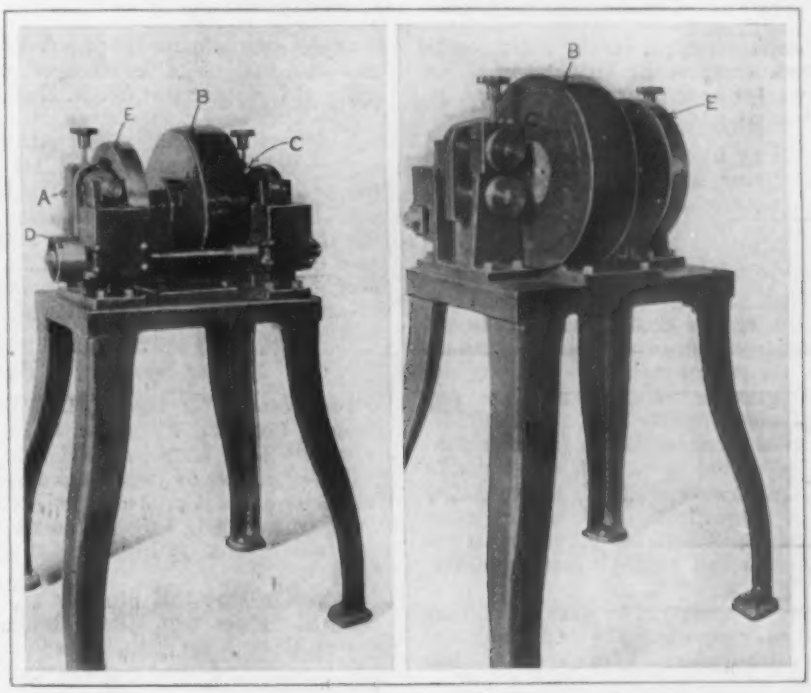
Being familiar with this company's shop methods, I asked the engineer how much it would have cost to pick up the entire machine with the shop crane and place it temporarily in a spot where there was plenty of light for photographing. The engineer scratched his head a moment and replied, "Oh, about 30 cents." An expenditure of this 30 cents, the writer figures, would have saved the company $30 easily, for then the retoucher could have handled the work unaided and he could have completed it in two days instead of five. Besides, the finished article would have been a better "work of art" than it now is.

This, admittedly, is an extreme case, yet the spending of 30 cents, say, to save only $1, is considered excellent economy, especially where the saving is immediate and not an outgrowth of years of investment. The writer can see no reason why the photographic department cannot be as scientifically managed as are the foundry, machine shop and office departments.

All advertising men agree, and so do most manufacturers, that plenty of good illustrations are needed for effective advertising. If so, would it not be well where possible, as in the example cited, to economize in such a way that two or three illustrations can be made at the present cost of one?

An Automatic Tube Straightening Machine

The Sleeper & Hartley Company, Worcester, Mass., has brought out an automatic machine of the swager type for straightening pipe or tubing rapidly. The speed varies for different sizes of material, the rate of production for gas pipe ⅜ in. in diameter, being 25 ft. per min.



Front View Rear View

Two Views of an Automatic Tube Straightening Machine of the Swaging Type Designed for Rapid Production

The machine consists of the customary rotating die carrying head B. The tube to be straightened is fed through this by the feed rolls which are driven through worm gearing from the pulley D. The work passes through the feed rolls at A, through the straightening head and a second set of rolls mounted at C which insures the complete passage of the tube. The head is driven by the pulley E from the countershaft of the pulley D. The machine is compactly built, weighing 700 lb. and occupying a floor space of 26 x 32 in.

The electric furnace which has been in use at Toronto, Canada, for some time in the manufacture of steel castings by James W. Moffatt and T. C. Irving, who designed it, has proved so successful that a much larger plant is to be erected. The furnace has made over seven tons of steel castings daily, of a quality claimed to be superior to crucible steel. The tests made at the University of Toronto show that the metal has a tensile strength of 75,000 to 90,000 lb. per sq. in. James B. O'Brien is president of the company which will erect the new plant.

Crumwold furnace of the Reading Iron Company, at Emaus, Pa., has now been in continuous operation for three and a half years without interruption for relining or repairs.

Steel Meeting of the Mining Engineers

Pulverized Coal, Waste Heat Boilers, Blast-Furnace Gas Cleaning, Beneficiated Ores and Over-oxidation of Steel Prominent Among Subjects Discussed

The Iron and Steel Committee of the American Institute of Mining Engineers held an interesting and valuable meeting in New York, October 16 and 17. There was a list of no less than 25 papers, most of them on timely subjects, and the attendance was upward of 175. The most animated discussion developed over the utilization of pulverized coal for metallurgical processes as differentiated from its application to cement manufacture, where it has been admittedly successful, but illuminating papers were also presented on, and wide interest taken in such subjects as blast-furnace gas cleaning, the use of fine ores and flue dust in the blast furnace, the over-oxidation of steel and the use of waste-heat boilers with metallurgical and heating furnaces. The impact test of steel castings also came in for attention and there was a paper covering a painstaking investigation of the carburization of various alloy steels and a study of the influence of copper on the physical properties of steel.

The first of the four professional sessions which were held was opened by the president of the Institute, Charles F. Rand, president Spanish American Iron Company, New York, who expressed deep regret that Charles Kirchhoff, through whose activities the Iron and Steel Committee came into being, had felt it advisable owing to illness to relinquish the chairmanship. He made formal announcement of the fact, noted some time ago in these columns, that Prof. Albert Sauveur, Harvard University, had been appointed chairman. On Friday evening an informal dinner was arranged in the Engineers' Club, while the general sessions were of course held in the Engineering Societies Building. For the varied programme and the generous contributions obtained, the committee was heartily congratulated in the luncheon periods provided on both days, and the following report, necessarily abbreviated, can cover only the main points, though the papers as a rule are treated at some length.

Use of Pulverized Coal in Metallurgical Furnaces

The present compelling subject of the utilization of pulverized coal was considered in the Thursday afternoon session, when three papers were presented.

Paper by Richard K. Meade

The first paper was by Richard K. Meade, consulting chemical engineer, Baltimore, who has been identified particularly with cement production engineering. While he regarded gas coals as the best for use in the pulverized state, it was, he said, possible to use coals less volatile and even powdered anthracite could be used if mixed with a coal more easily ignited, and the whole development was providing, he suggested, for the employment of culm and coal dust. Coals running as high as 30 per cent. in ash are used satisfactorily in the cement industry, and as regards danger of fire in the grinding mills, he said there were none if the buildings were properly built and ventilation provided for. He called attention to the fact that powdered fuel needs to be stirred up to burn at all readily. While the paper was given over chiefly to the equipment usually to be found in cement mills, he showed by means of a lantern slide the installation for nodulizing at the plant of the Pennsylvania Salt Mfg. Company, Philadelphia.

As regards the cost of operating, he gave an estimate for a plant of 80 tons daily capacity. The total charge was $31.92, covering the coal, attendance, laborers, the grinding operation, this needing 90 hp. in power, supplies and repairs, or a unit cost of operations per ton of about 40 cents. A plant of 150 to 200 tons daily capacity for 22 hr., the size, it is understood, of the Pennsylvania Salt plant, he placed at $20,000 to $30,000 in first cost.

In the discussion he mentioned types of pulverizers which allow for taking the coal directly to the burner without requiring storage bins. He defined coal as suitable for utilization in the pulverized form when it contained over 25 per cent. volatile matter or was long flaming, as when used on the grate. He admitted that the last definition was perhaps not quite technical. Prof. D. S. Jacobus, advisory engineer, Babcock & Wilcox Company, explained that low volatile coal gives a long flame burned on the grate, and this introduced an active discussion with regard to length of flame and the causes of it. Mr. Meade contended that the length did not depend on the blast but rather on the draft. The finer the coal, he added, the shorter was the flame and the quicker the combustion. The usual fineness of pulverization is such that 90 to 95 per cent. passes through a 100 mesh sieve. He suggested that gas coals had generally been used up to the present time because they are the cheapest.

Comparing Fuel Oil and Powdered Coal

In discussing the comparative value of fuel oil and powdered coal, he thought that the capacity of a kiln was about the same whether oil or powdered coal were used, at least they were about the same on a British thermal unit basis. On this question W. R. Dunn, Vulcanite Portland Cement Company, Phillipsburgh, N. J., said that pulverized coal increased the production capacity of the cement kiln over oil as much as 20 per cent. He found that 110 lb. of coal gave as much cement as 11 gal. of oil, although of course it depends on the calorific values. It was brought out later that this ratio was the same as 2000 lb. of coal compared with 5 bbl. of oil and this on the reminder of Bradley Stoughton that 3 bbl. of oil are commonly regarded as the equivalent of 1 ton of coal, showed decidedly better performance for powdered coal.

Paper by H. R. Barnhurst

The second paper was by H. R. Barnhurst, Fuller Engineering Company, Allentown, Pa., and was in a measure an expansion of his paper read September 30 before the Engineers' Society of Western Pennsylvania, at Pittsburgh. This latter paper is printed elsewhere in this issue, so that it suffices to supply here the points made in the second paper not covered at length or at all in the Pittsburgh paper.

In noting that coal properly ground will burn thoroughly if 85 per cent. passes through 200 mesh and 95 per cent. through 100 mesh, he mentioned that he has found in such properly ground coal a percentage above 70 capable of passing through 300-mesh screens. As we can burn all the coal thus prepared, he said, including the rejections when the percentages named pass the 200-mesh and 100-mesh screens, there seems to be no good reason for pushing pulverization beyond this point. Coal can be cheaply brought to this condition and the mills able to do this work have large capacity. Higher percentages may be reached by the sacrifice of capacity, and consequently economy. This standard of 85 per cent. through 200 mesh and 95 per cent. through 100 mesh is a practicable commercial standard and should be maintained.

Other extracts from Mr. Barnhurst's paper are as follows:

Control in Burning Pulverized Coal

However short we may be of pyrometers, there is in the eye of the intelligent operator a gauge which tells him at a glance whether the heat he has is serving his purpose. Pulverized fuel has a great advantage in this respect.

It need not be supposed that an operator must be perpetually adjusting his apparatus. If we find that with the air-gate fixed at a certain opening the fire is too hot, a simple reduction in the quantity of fuel admitted lessens the source of heat and changes the ratio of the air to the fuel. If not hot enough, more fuel gives more heat units entering and a lessened excess of air, resulting in a heightened temperature. In all probability it will be found

that excess air must be admitted constantly to keep the heat from reaching destructive limits. With control of both the quantity and quality of heat, this danger is negligible.

If we consider the burning of coal as shoveled or fed in bulk, it must be conceded that a certain degree of comminution or pulverization takes place in the fire as a necessity of combustion. Coal does not burn in lumps, but its ash comes away pulverized, and this gradual pulverization occurs in the fire at the expense of some of the heat units in the work done. As this is done slowly, it is often necessary to supply large grate area so that the collective surfaces exposed for disengagement of heat shall be sufficient for the purpose for which the fire is used. In the use of pulverized coal, therefore, we have best prepared this fuel for the absorption and evolution of heat, and in addition we prepare the air by practically a similar subdivision for joining in the process.

In projecting thus a cloud of fuel into a highly heated chamber, each particle because of its opacity becomes an absorbent of heat radiating not only from the chamber walls, but from each neighboring particle as it inflames. This inflammation progresses with rapidity almost inconceivable. Pulverized fuel injected thus with its air supply at a speed of several thousand feet per minute inflames right up against the delivery nozzle, the flame playing about its mouth. This is best accomplished by avoiding high pressure for projecting the fuel. The final mixture of air and fuel is at the instant of projection into the furnace.

Experience in Ore Roasting and Open-Hearth Practice

In roasting carbonate ores of high sulphur content, the carbon has been driven off and the sulphur reduced within permissible limits by the use of less than 7.5 per cent. of fuel upon the weight of the charge. This problem involves the maintenance of a low temperature, about 2100 deg. F., to prevent the agglomeration of the ore fines into masses. The same practice obtains in the roasting and nodulizing of ores and flue dust, where the heat is maintained sufficient to permit the ore to form nodules or balls, but not to stick to the walls of the roasting kiln.

In open-hearth practice with pulverized coal, steel is being made with this fuel at the rate of from 450 to 500 lb. per net ton of product. This is an average of 45 heats, the fuel and product being carefully weighed. The melts were obtained in slightly less time than with oil, which had been used previously. An analysis of the slags produced with each fuel is as follows:

	Oil	Coal
SiO_2	16	16.5
FeO	22	18.2
MnO	7.4	6.7
P_2O_5	1.7	1.9
Final analysis of the steel:		
Sulphur	0.025 to 0.035	0.035 to 0.04

Sulphur in coal, 1 to 1.15 per cent.

There appears here to be no more difference than would occur daily in the variations of the charge and of the fuel. In puddling furnaces the fuel supply varies with the season, the cool weather of spring and fall permitting a larger output than when intensely hot weather affects the men tending the furnace. It is safe to say that iron can be puddled at an average expense of 1200 lb. of pulverized fuel per gross ton of muck bar produced; in fact, less than 1000 lb. of coal per gross ton of bars has been shown in practice during periods when favorable temperatures and continuity of work conduced to high economy.

Ash, Cutting and Other Problems

In the discussion the author explaned that in an experimental furnace for burning low volatile fuel, he had succeeded with coke breeze with 15 per cent. ash, tailings from coal for by-product ovens, having as high as 58 per cent. ash, and this was burned without trouble, as he mentioned in his Pittsburgh paper. He claimed there was no slag formation, with the furnace connected with a boiler, but that instead the ash collected in a fine powder, easily removed, although it is desirable to remove the ashes every ¾ or 1 hr. Prof. Alfred Stansfield, professor of metallurgy, McGill University, Montreal, mentioned that furnaces were working at Sudbury, Ont., satisfactorily with powdered coal, but in this case the ores are not high in silica. He understood also that the waste heat boilers there were operating well.

Mr. Barnhurst explained that cutting, experienced in different cases, was due to high blast. In practice with which he was familiar, an 80-lb. blast through a ¾-in. pipe was used within a 3-in. pipe at 1 lb. pressure, this supplying 15 or 20 per cent. of the total air required. By projecting the coal dust in this way, rapidly, and with an insufficient amount of air, one was able to gain the long flame.

Paper by W. S. Quigley

The paper by W. S. Quigley, Quigley Furnace & Foundry Company, Springfield, Mass., was read by E. W. Shinn, of the company, in the absence of the author. At the outset he stated that the problem of burning pulverized coal in cement kilns was not the same problem as that of utilizing pulverized coal in furnaces. The burning was not simple, which was attested by the fact that the development has not been exceedingly rapid, notwithstanding the fact that the Oliver Iron Company applied pulverized coal 30 years ago to the puddling furnace, but apparently without great success. He paid a special tribute to John B. Culliney, superintendent for the American Iron & Steel Mfg. Company, at Lebanon, Pa., who had achieved success, though not until after an expenditure of $50,000 in experiments, which now give the American Iron & Steel Mfg. Company the distinction of being the institution first to enjoy success.

Mr. Quigley seems to believe lignite can be used but that anthracite is so difficult to light that a mixture is needed to keep it ignited, as had already been brought out. He believes that the days of the gas producer are numbered, and that with the almost total utilization of the heat of the fuel when burning it in the pulverized state, enormous savings can be effected over present methods of burning coal, making the entire movement one of tremendous effect for conservation. This fact he brought out in referring to the losses with hand fired coal consuming furnaces, where commonly one-half of the fuel energy is lost. In referring to the possibility of utilization of lignite, Mr. Quigley mentioned that the total production is about 450,000,000 tons per year and that a saving of $137,000,000 in fuel costs could easily be effected. Incidentally, he suggested that the relatively dull times which appear to be here are likely to have a good side in the incentive given to study economies. He stated briefly that he was installing a plant in a tube works, where a $43,000 investment was expected to save $70,000 over the cost with anthracite coal now being used.

Four Requirements in Utilizing Powdered Coal

Four general requirements were set down covering the utilization of pulverized fuel: one, that the coal should be dried; two, that the coal should be thoroughly pulverized; three, that the feed of the fuel should be uniform; four, that the air pressure should be such as to suit conditions. Moisture, he explained, tends to maintain little balls of the powder, a condition not conducive to rapid or complete combustion, and he stated that the percentage of moisture should not be over 15, and he put the minimum at 1½ per cent., though the coal itself should be dried to ½ per cent. moisture. For 100 lb. of coal dried, he allows 2 lb. of coal burned in the drier, and as regards fineness of grinding, he would have 90 to 95 per cent. pass through a 100-mesh screen and 80 to 85 per cent. through a 200-mesh screen. Fine grinding, he said, can be overdone, as one may get too intense a flame, with resultant high furnace repairs.

In reference to the feeding of the fuel, he told how Mr. Culliney had imported a number of burners or controllers, until finally it became necessary to develop what Mr. Quigley termed the present return screw or double worm controller, which has been used for eight years for furnaces and bolt fires and even for furnace work. A high pressure air of 60 to 100 lb. was first used, with poor distribution of heat, and experiments led to the use of low pressure, the pressure depending in part on the distance of the controller from the furnace.

Performance at a Number of Plants

He claimed that coal was safer than either oil or gas, as regards explosion, as the system is dust tight. The American Iron & Steel Mfg. Company is using 140 tons of pulverized coal a day at Lebanon and 70 tons at Reading, and has, Mr. Quigley calls attention, the largest pulverized coal equipment in the world, with the additional interesting fact that the furnaces are operated smokeless. He was not sure but plants would occasionally be required to adopt pulverized coal burning in order

to secure the smokeless feature. He explained that the equipment of the American Iron & Steel Mfg. Company included small furnaces, such as those 18 x 36 in. in size, requiring 40 lb. of coal per hour to those 9 in. x 4 ft. and 15-ft. square flanging furnace. He referred at some length to the economies of pre-heating the air. The cost of pulverizing the coal, including the conveying of it, he put at 48 cents a ton.

He described an experience at the Schenectady plant of the American Locomotive Works, where a 5-ft. 6-in. x 18-ft. furnace for heating blooms required 650 lb. of coal, in the case of a hand-fired furnace, and only 350 lb. in the powdered coal furnace of identical size, with the additional fact that the powdered coal furnaces were 20 per cent. faster. Similarly in the drop forging shop, it required 15 min. to get the product heated satisfactorily in oil furnaces, while only 12 min. were necessary with the pulverized coal furnace. In other words, there was not only a reduction in the time, but naturally as a result, an increase in production.

Numerous lantern slides were shown to give an idea of the pulverized fuel equipment provided for the General Electric Company, for the American Steel Foundries at Sharon, Pa.; for the Burden Iron Company, Troy, N. Y., where there are 42 puddling furnaces and 9 heating furnaces equipped for burning pulverized coal, and the Lima Locomotive Works, the latter plant being particularly conspicuous for the long overhead enclosed moisture-tight conveying systems required for transporting the pulverized fuel from the grinding department to the point of use, where the controllers are located. It was explained that the Burden Iron Works plant would probably be in operation in its entirety in about two months, except for a few horse-shoe furnaces. The conveyors are of the helical or screw type.

The Ash in Open-Hearth Furnaces

Considerable interest was shown in the discussion following this paper also, regarding what becomes of the ash in such furnaces as those of the open-hearth type. Mr. Shinn admitted that one would find ash in the bath, in the checkers and in the stack, with the likelihood that most of it will be found in the bath, and that in the case of the acid furnace, it will be found mainly mixed with the slag, and in basic furnaces probably more limestone will be required. He referred to the fact that in some furnaces the ordinary checker work is being replaced by baffle walls, with, it is understood, the equivalent heat storage capacity of the ordinary regenerative arrangement. In the case of several forging furnaces, Mr. Shinn admitted that a little slag collects on the forging, but he had not learned that this turned out to be any detriment.

Samuel K. Varnes, experimental engineer of the Pennsylvania Steel Company, Steelton, questioned particularly what is likely to become of the sulphur in pulverized coal high in sulphur, but Mr. Shinn did not feel that he had enough information to answer positively, although it was the opinion of a number that the combustion is sufficiently good that the sulphur disappears pretty largely up the chimney flue, as sulphur dioxide gas. That the troubles from slagging in the checkwork are over accentuated was the impression conveyed by Mr. Barnhurst.

Experiences with Beneficiated Ores

Three papers were read at the Thursday afternoon session on the utilization of concentrated lean ores and flue dust. One was by Ernest Stütz, New York City, devoted to the Scoria process for manufacturing fine ore briquettes, some of the general features of which system were given in *The Iron Age* of February 20, and one was submitted under the joint authorship of Felix A. Vogel and A. M. Tweedy, of the General Briquetting Company, New York, on the Schumacher process in the United States. The discussion of the two papers amounted to a dialogue between Mr. Vogel and Mr. Stütz. Mr. Vogel was inclined to doubt some of the figures of unit cost of briquetting given in Mr. Stütz's paper, but Mr. Stütz in his reply explained that in the German sources from which the figures were obtained there had been no question since the presentation of them. The third paper covered the use of nodulized ore in the blast furnace, presented by Richard H. Lee, superintendent of blast furnaces of the Pennsylvania Steel Company, Lebanon, Pa. The main discussion on this paper was contributed by J. E. Johnson, Jr., whose contribution with a review of the paper is presented with the other papers as follows:

The Paper by Ernest Stutz

Mr. Stütz explained that in the Scoria process (which had worked so successfully at the 200-ton daily capacity plant at the Rheinhausen works of the Krupp Steel Works that the installation has now been doubled), the granulating slag and the lime are mixed with the valuable materials and made hydraulic in rotating steaming drums, where they are exposed to moderate-tension steam. The powdery mass is conveyed to presses to be formed into bricks, which are carried in trainloads of trolleys to cylindrical kilns, in which they are hardened by being exposed to the action of high-tension steam for from 8 to 10 hr. The trainload of hardened bricks is then ready for the blast furnace.

He submitted a table covering the annual production and manufacturing costs of 12 different processes with the Scoria lowest at a unit cost of 32 cents. He mentioned a trial run of several days' duration, in which a proportion of 43 per cent. of the charge (burden plus limestone) was added in the shape of Scoria briquettes without in any way interfering with the regular running of the furnace. He held that the hydraulic binder gives the body the necessary consistency at a minimum consumption of binding material, and, being in the nature of a hydrosilicate, leaves the oxides freely accessible to the top gases. He argued further that if the remelting of the slag involved is regarded as wasteful, the cost of melting, say 4 or 5 per cent. of the weight of the briquettes cannot be compared with the cost of coke wasted through the tendency of fine material to scaffold, quite apart from the fact that there are many occasions when the slag is positively beneficial, as in the utilization of ferromanganese slag in order to increase the manganese content of basic pig iron. He said that the inventor expects to perfect operating conditions to produce 1 ton of iron in a day for every cubic meter (35 cu. ft.) of blast furnace volume.

As proof of the growing favor the process meets with abroad, he mentioned the completion in April of a plant of a capacity of 400 tons per 20-hr. day for the Aktien Gesellschaft für Hüttenbetrieb, Duisburg-Meiderich, the trial operation of which turned out so satisfactorily that a doubling of the installation is, he said, contemplated for the near future.

The Paper by Messrs. Vogel and Tweedy

The paper contributed by Messrs. Vogel and Tweedy covered the operation of two plants in the United States using the Schumacher briquetting process. The following notes have been taken from the paper:

Dust Briquetting at Johnstown, Pa.

An experimental plant, consisting of a toggle press and a hydraulic press, was installed at Johnstown, Pa. An attempt was made to briquette a mixture of Mahoning fines and blast-furnace flue dust, in a ratio of 7 parts of ore to 3 parts of dust. The results were unsatisfactory, in that the briquettes made were not hard enough to stand the severe handling to which they were subjected in the various transferences necessary between the press and the furnace. The trouble was due to several causes: 1. The mechanical arrangement of the plant, which did not lend itself to a proper hardening and loading of the briquettes into the cars. 2. The irregular composition of the flue dust, as to both its lime and its fine coke contents. 3. The variability of the moisture content of the ore, and its viscosity when wet. 4. The ratio of fine ore to flue dust; that is, it was attempted to bind in too large a quantity of fine ore for the small amount of flue dust used.

The first trouble could be overcome, and has been improved upon in the plant as it stands today. The second trouble was important, because of the small amount of dust used as a binder, and might have been easily removed by mixing the flue dust of the different furnaces, which, however, was never done. The third difficulty was more serious, but could have been partly solved, had it been possible to meet this along with the fourth difficulty, by decreasing the percentage of ore in the briquettes. It

was proposed to do this, but it seems that the problem at the works in question is, primarily, to prepare Mahoning fines for reduction in the blast furnace, and only secondarily to use up the flue dust, and a solution along this line did not seem to be interesting.

Dust Briquetting at Lackawanna, N. Y.

In Lackawanna, N. Y., a single-press experimental plant was installed in October, 1912, and operated for a trial period until August 1, 1913, when it was taken over by the steel company, and is now being operated by them. The plant consists of a single toggle press installed alongside of the end of the regular coke bins, two of which bins have been utilized as storage bins for flue dust. The flue dust, as drawn in hopper-bottom cars from the dust catchers of any one of the seven furnaces, is dumped through a 1-in. wire screen into the dust storage bins. Any coarse coke or limestone caught in the screening is shoveled or raked into an adjoining coke bin.

From the storage bins the dust is drawn off through cylindrical spouts, 18 in. in diameter, to two table proportioners feeding a standard pug mill 10 ft. long, of the ordinary single-screw type. In this pug mill, or mixer, water and a 10 per cent. solution of iron sulphate are added, the amount of solution being such that the actual salt added is 0.25 per cent., by weight, of the flue dust. The amount of water is varied with the character of the dust, and is such that, with the water in solution, the total moisture in the dust as it leaves the mixer is from 8 to 10 per cent. From the mixer the dust feeds directly into the press, where rectangular briquettes 7.75 x 6 x 3.25 in. are formed, under a pressure of 5600 lb. per square inch. The press is operated at a speed to deliver 20 briquettes per minute, or 1200 per hour. Briquettes weigh from 11.5 to 12 lb. apiece, so production is at the rate of about 6 tons per hour.

Some of the Practical Experiences

The dust should be cool enough not to burn the hand when handled before going into the press. In cases where the briquettes were too hot, and dried too fast, some improvement could be made by sprinkling the briquettes with water. This helped to harden the briquettes to the depth to which the moisture penetrated, but as this was not very deep, the briquettes at best were only case hardened. In a number of cases, particularly when the furnaces were acting badly, or when a shipment of lime contained a large amount of fines, the flue dust was found to contain a large percentage of unslaked lime. Slaking was started in the mixer, especially if the dust was hot, and was not completed until after the briquettes were molded and set to harden, when the incidental expansion of the lime in slaking tended to loosen and crack the briquettes. This difficulty was met by introducing steam into the mixer, and by changing the lead of the blades of the mixer screw so that the dust was held in the steamy mixer until the lime had time to thoroughly slake, when it did no harm to the briquettes.

Liners for the molding boxes had to be changed every six weeks, and experiments were made with different steels and temperings, to determine the best material for such liners. Ordinarily open-hearth rail steel with 0.80 per cent. of carbon, untempered, proved the best. Liners now being made are tapered on diagonally opposite sides, so as to be reversible when one side is worn, and yet to make good briquettes until entirely worn out.

Good briquettes, if not better ones, are made with 50 per cent. of fresh dust and 50 per cent. of weathered dust, the reason being that the weathered dust is always cool. At least two or three months of weathering is necessary before dust becomes too inert for briquetting alone.

In a single month of which we have complete records the results show a production of 2727 tons made in 23 working days at a total cost, including all overhead expense, of 60 cents per ton. Of this cost, the largest single item, that of handling briquettes after they are made, would be cut in half, if not further reduced, in any permanent, properly designed plant. The cost of catalytic also would have been reduced if pickling liquor had been used, and the total cost might easily have been brought down to 40 cents per ton. One furnace in June, when 13.71 per cent. of briquettes was carried, made a little more iron with a smaller coke consumption and less flue dust, 2.26 per cent., than it did in previous months with less briquettes.

The Paper by R. H. Lee

The following abstract has been made of the paper on "The Use of Nodulized Ore in the Blast Furnace," presented by R. H. Lee:

No True Pores in Sintered Material

The fact that the material in a briquette is sintered is proof positive that there are no pores in the material. The holes of greater or less diameter through the substance of the briquette are not pores in the common acceptance of that term, as the sides of the holes and channels are fused. In reality the material is simply mill cinder. It is practically untouched by the gases in the upper part of the furnace, and the iron has to be reduced by solid carbon in the boshes and hearth. Briquettes sometimes show a little saving in fuel in the furnace over an ore mixture of large lumps, but that saving is made simply because, owing to the numerous holes and channels through the mass, the briquette is practically composed of numerous small or fine lumps, and, as is well known, the finer the ore is, the lower the fuel consumption, other things being equal. The limiting condition on fineness is the high pressure developed by the fine ore clogging up the mass of stock in the furnace, and the consequent hanging and slipping, and the irregular distribution of blast.

The physical structure of any sintered product depends more upon its chemical analysis than upon the process of manufacture. It is not true that nodules are vitreous lumps and that briquettes have an open and porous structure. That is entirely too broad a statement, for in all products agglomerated by heat the binder is a slag, some combination of an oxide of iron with lime, silica, alumina, or all, and sometimes with magnesia in addition.

If the ore is low in iron, say 50 per cent., then any process of sintering will probably produce a clinker similar to mill cinder; that is, the whole mass will fuse completely. At the other extreme, with a very fine magnetite, for example, it is very difficult to produce any sintering at all. With ores analyzing, say, from 58 to 64 per cent. of iron, the proportion of acid to basic elements in the gangue is very important. With Cornwall ore the most infusible mixture is formed when the quotient of the bases (lime and magnesia) divided by the acids (silica and alumina) is between 1/3 and 1/5. The ideal result is obtained when just sufficient slag is formed to bind the grains together in a solid but porous mass.

The ideal conditions for either briquettes or nodules rarely occur in practice, so that, in estimating the value of these sintered products for a furnace mixture, both briquettes and nodules must be taken as composed of about 98 per cent. of mill cinder and 2 per cent. of porous ore.

The Size of Nodules and Furnace Operation

Nodules from concentrates made in a revolving kiln, when of the proper chemical composition (in the case of nodules made from concentrated Cornwall ore this has been shown by experience to be about: Fe, 58; SiO_2, 8; Al_2O_3, 2; CaO, 3; and MgO, 3.50 per cent.), run in fines from 0.75 in. in diameter to powder passing through a screen 100 meshes to an inch. The amount of such fines, however, is extremely small.

We find by the experience of six years that when not more than 2 per cent. of the nodules pass the 20-mesh screen the very best results are obtained in the furnace, as to both fuel and production. A large percentage over 0.75 in. in diameter is of no especial advantage except in lightening the pressure of the blast to a slight degree, and the greater the percentage around 0.25 in. in diameter, the better; above this size the nodules seem to require more fuel. Below it the driving of the furnace is retarded by the increased difficulty of blast penetration and distribution.

The size of the nodules depends very greatly upon the composition of the ore, as above stated. Sometimes when a lot of lean ore is delivered to the concentrator the resulting nodules may run as low as 54 per cent. in iron, with a corresponding increase in the percentage of gangue, but the nodules are always quite coarse; as much as 60 per cent. will remain on the 0.75-in. screen. In this case the blast pressure will at once lessen and the furnace will drive faster.

Again some rich ore will go through the concentrator, bringing the iron in the nodules up to 60 and even 62 per cent.; in this event the nodules will be much finer; sometimes as much as 30 per cent. will pass through the 20-mesh screen. After the furnace has been filled for 6 or 8 hr. on this mixture the pressure will go up, the driving will slacken, and unless precautions are at once taken the sulphur in the iron will run up, and there may be sticking and hanging unless the pressure be kept down to reasonable limits. As the Pennsylvania Steel Company at its Lebanon plant runs almost all the time upon low-phosphorus low-sulphur iron, with whatever silicon the customer demands, it is of great importance that conditions in the furnace be kept regular.

The Cornwall ore itself as delivered to the concentrator will vary from 30 per cent. iron to 45 per cent., with similar

variations, of course, in the gangue. To get an absolutely regular product commercially and under working conditions with such varying ore is manifestly impossible, but by attention and study the nodulizing plant has reduced the variations in the iron content of the nodules to an average of from 56 to 60 per cent., and by using a series of holding pits for the concentrates the daily variation in the nodules is rarely over 2 per cent. in iron, with corresponding differences in the amount of gangue.

The Fuel Question with Nodules

The nodules themselves, being a fine ore, fill more or less the openings between the pieces of coke, and if the pieces of coke are soft, and crumble with a large percentage of breeze, it can easily be seen that the blast will have great difficulty in penetrating and distributing itself through the resulting mass. On the contrary, with hard coke and coarser nodules no difficulty whatever is experienced in using all nodules; the pressures are not high, the fuel is moderate, and the furnace works far more regularly than with Mesabi ores. In fact, all difficulties in working nodules come from softness of the coke and the fineness of the nodules. Where these two elements are absent, a furnace will work as well on nodules of any chemical composition as on any other iron-bearing ore. The chemical composition of the nodules can be taken care of by proper fluxing, but for packing in the furnace through soft coke or excessively fine nodules there is no remedy whatever, and where these two conditions hold a furnace will never run so successfully on all nodules as on gas-reduced ore or ore in lumps.

The amount of fuel needed per ton of iron made from nodules, using well-burned by-product coke made from a mixture of mountain coals, runs from 2300 to 2400 lb. in good practice. Little iron is reduced by the gases because of the nature of the nodules, which are but small lumps of mill cinder, requiring solid carbon for reduction; but if the coke happens to be soft the fuel will increase enormously, a vast amount being consumed in the upper part of the stack by the CO_2. With first-class Connellsville beehive coke the fuel would be less, because we have generally noticed that whenever we have charged Connellsville coke the silicon in the iron will jump up, sometimes being raised from around 1.5 to 2.5 per cent. in the casts made on the Connellsville coke.

The Size of Nodules and Furnace Operation

A very important point in working on all nodules is the location of the melting point. When too low, although the silicon may be high and the furnace hot, yet the gases will be thin, the pressure very high, and the furnace will slacken in driving to hardly more than half the usual gait. On the other hand, a too high melting point will give gases which, while extremely abundant, will burn with difficulty on account of their dustiness. The pressure will be lower than normal, and the driving very fast, but the burden carried will be less than in the best conditions, the hearth cooler, and the sulphur kept down in the iron with great difficulty, but with a good production of iron.

The variations in fineness in the nodules require pretty careful watching of the penetration of the blast, and to find out whether the blast is uniformly distributed over the tuyere area the old-time test is used, viz., driving a bar through a tuyere into the center of the furnace as quickly as possible, allowing it to remain for 2 min., withdrawing it rapidly, and examining the bar to see whether it is uniformly heated, or hotter in spots. With nodules it seems to be even more important to have a uniform heat over the tuyere area than with ores reduced by the gases.

With nodules, as with all other ores, a moderate-sized furnace seems to be more economical than the jumbos. All difficulties from soft coke and fine nodules are increased when our 100-ft. furnace is working on all nodules, and harder coke and coarser nodules are required for success than with the 80-ft. furnace.

In conclusion: with a hard regular coke, and nodules of which 95 per cent. will remain on a 20-mesh screen, there are no especial difficulties in working on all nodules, provided some procedures dictated by experience and probably different at every plant are observed. With soft coke and very fine nodules trouble will be had at any furnace and under all conditions of management. The slag volume required for working with nodules is, within reasonable bounds, not very important.

Discussion by J. E. Johnson, Jr.

In discussion of both the Lee and the Vogel-Tweedy papers, a written contribution was made by J. E. Johnson, Jr., consulting engineer, New York City. It was in part as follows:

A short time ago I received authentic data giving some details of the present operation of one of the largest and best plants in the country. I was struck by the salient points in these data: First, that the fuel consumption averaged about 2150 lb. of coke, analyzing 88.5 fixed carbon; the other was that only about 51.5 cu. ft. of air at 60 deg. F. were required to burn a pound of coke. I knew that this plant had formerly made fuel records over long periods of about 1700 lb. of coke, and while I had no figures of blast required per pound of coke in that practice, I had figures giving this for very similar practice at another plant and about the same time. This figure was 70 cu. ft. of air per pound of coke. These two facts considered in conjunction with some extensive investigations I made earlier in the year, concerning charcoal practice, gave the explanation of these two great changes.

Explanation of High Fuel Requirements

In the earlier days before the introduction of the Mesabi ores as a major portion of furnace burdens, the old range ores constituted the principal ore supply. These were exclusively of two kinds—lump and soft—the soft being so plastic that it will stand in an almost vertical shape and will scarcely run at all. When these ores were charged into the furnace they could not and did not run down into intimate contact with the coke, except on the top surface of the latter, with direct contact between the two virtually only in one plane. With the Mesabi ores all this was changed. These ores, being fine and sandy, as soon as they are dried in the upper regions of the furnace, run almost like a liquid down through the interstices of the coke as the charges descend and the points of contact between the two are increased to a vast extent.

It is well known that the oxygen of ore in contact with carbon will attack the latter and carry it away with extreme rapidity, irrespective of the composition of the surrounding gas and throughout the entire range of temperatures occurring in the upper regions of the furnace. This well-known action could go on in the older practice only along the single plane of contact between the ore and the coke, but with the great preponderance of Mesabi ores, it can now take place throughout almost the entire mass, thus dissolving a great percentage of the coke in the upper levels of the furnace. This is proved by the small quantity of blast required to burn the coke.

The theoretical quantity required for this purpose may be easily calculated: 2150 lb. of coke at 88.5 per cent. fixed carbon contain 1900 lb. of fixed carbon; deducting from this 90 lb. to cover the carbonization of the iron and a little loss through gas escaping around the bosh, we have 1810 lb. of carbon to be burned per 2150 lb. of coke charged into the furnace, or 84.1 per cent. of the weight of the coke.

The oxygen to burn a pound of carbon to CO is 1 1/3 lb. The air required is 100÷20.7 times as much, or 6.43 lb. of air per pound of carbon. As the coke gives only 84.1 per cent of fixed carbon to be burned, this would require 5.4 lb. of air. Air at 60 deg. F. weighs 0.0765 lb. per cubic foot. Therefore, 70.6 cu. ft. would be required to burn a pound of coke at the tuyeres under these conditions. As a matter of fact, only 51.5 cu. ft., or 73 per cent. of this amount, were required. In other words, more than one-fourth of the whole amount of coke must have been dissolved by the direct action of the ore and carried out the top of the furnace without ever getting into the hearth at all. If we take 73 per cent. of 2150 lb., we obtain 1570 lb., which is somewhat under the good records of the earlier days, as it properly should be.

Fuel Economy Not Decreased by Lean Ores

It is commonly considered that the decreased percentage of iron in the ore and the simultaneous increase in silica is responsible for the decline in fuel economy above mentioned, but, in my judgment, this belief is without adequate foundation. It is true that the lumpy ores of Lake Superior averaged at one time almost 60 per cent. in iron and that the average furnace burden today averages only 50 or 51 per cent., but this change is due in large part to the fact that the softer and finer ores contain several times as much moisture as the lumpy ores of an earlier day. Five or 6 per cent. of moisture was normal 20 years ago, whereas many ores today contain from 12 to 15 per cent. and not infrequently 5 or 6 per cent. of combined water in addition. The increase in silica has probably not been so great as might appear on casual examination for the same reason. It is doubtful if furnace burdens ever averaged less than 5 per cent. in silica and the bulk of the ores in use today probably do not average over 8 per cent. It must not be forgotten either that there has been an increased tendency to increase the silica in the mixture deliberately in order to get a larger slag volume, this probably being necessitated by the greater

volume of sulphur which the increased coke consumption introduces into the furnace.

Looking at the matter from another point of view, it is doubtful if the slag volume per ton of iron today is greater than 1100 or 1200 lb., and in the old days it was probably never less than 800 lb. Such an increase in the slag volume should only produce an increase in the coke consumption of about 100 lb. as against 4 or 5 times that increase which has actually taken place. For these reasons the view that the increasing leanness of the ore accounts for the increase in fuel consumption does not seem to be tenable, but rather that the change is caused chiefly by the physical condition of the ore.

Dwight-Lloyd Sinter Comparable to Lump Ore

I was recently told by some friends that the best figures obtainable from the use of the Dwight-Lloyd cellular sinter in furnaces increased the fuel economy of those furnaces to a greater extent than could be accounted for by the greater richness of the material. After realizing the enormous loss caused by excessively fine ores in modern practice, it occurred to me that there was probably much more truth in the claims of the advocates of a cellular sinter than I had at first been willing to admit. My experience with the dense varieties of nodules which may be called artificial magnetites has been such as to make me extremely doubtful of any claims of increasing fuel economy by their use, especially in conjunction with more reducible ores, but this sponge or completely cellular material must be admitted to have the maximum of advantage from the point of view I have just attempted to bring out. These properties, due to its peculiar structure, mark it as a distinctly new metallurgical product. The material is lumpy and angular, and therefore has a minimum of points of contact with the coke, and for this reason the solution loss of the coke must be small, as with lump ores.

On the other hand, the material is of so open a structure that a gas current can pass through it freely. Its cell walls are extremely thin and therefore its exposure to the heating and reducing action of the gas is a maximum, with a minimum of exposure to the coke, thus simultaneously promoting indirect or gaseous reduction and cutting off direct reduction through contact with the coke, with corresponding benefit to the fuel economy. It is easily conceivable that a layer of this material charged immediately on top of the coke would act as a mattress to cut off passage of finer ore charged on top of it and so promote economy to an even greater extent than the quantity charged would lead one to estimate.

The artificially prepared ores from the rotary kiln have not these advantages. It is true that they are in larger pieces than the fines, but their bulk per unit of weight is not nearly so great as that of the cellular sinter, while the small round pellets which comprise so great a portion of the whole mass of nodules are in the ideal state for running down through the coke to the maximum possible extent. On the other hand, the pores which may be formed in this material to permit egress of the gas evolved on heating it are sealed and welded shut by the continual rolling which it undergoes during the process of formation. The nodules also have a minimum ratio of surface to mass; therefore their exposure to the gas is the smallest possible. For this reason this material is likely to reach the zone of fusion very largely unreduced, requiring to be reduced there with direct carbon and high heat.

I have operated a furnace on a mixture of three-quarter brown ore and one-quarter of such nodules and I know that more fuel was required as well as greater time in the furnace and consequent reduction of output, though the furnace was very slowly driven to begin with. For this reason it seems to me likely that a burden of a cellular sintered material should give better fuel economy than either fine reducible ore on one side or nodulized ore on the other. The figures that I have given above from actual practice show the loss resulting from the use of fine ore, and are an indication that this saving may be of very great commercial importance. They suggest that making a cellular sinter of the fine portions of Mesabi and other ores and concentrates would effect a great economy in the furnace in spite of the current opinion on the subject. It points a way toward attaining the low fuel economy of 20 years ago.

Contribution by Emile Hiertz

A contribution to the general subject was made by Emile Hiertz, Seraing, Belgium. He described briefly the agglomeration of flue dust by the chloride of magnesium method at the works of the Societé John Cockerill, Seraing. The two presses produce 1000 briquettes per hour, weighing 5 kg. (11 lb.) each, under a pressure of about 5690 lb. per square inch. The chloride of magnesium is approximately a 35 per cent. solution and the quantity of solution added to the flue dust varies between 2 and 3 per cent., so that the briquettes contain about 1 per cent. To fresh dust as much as 10 per cent. of coke breeze may be added and briquettes made that still have a crushing strength of 377 to 426 lb. per square inch after 36 hr., and 640 lb. per square inch after 6 days. After having treated 140,000 tons of the material, the reports of the blast furnaces show that the briquettes improved the action of a furnace and produced less dust than did Minette ore. As much as 35 per cent. of briquettes is added to the furnace charge without bad effects on operations. The presence of chlorine did not produce any corrosion in the furnace, downtakes or other piping. The presence of a certain amount of chlorine in the dust reduces the amount of chloride of magnesium which it is necessary to add for briquetting. The daily production at present, with three presses averages 200 tons.

Cleaning Blast Furnace Gas

W. A. Forbes, secretary of the coke and blast furnace committees of the United States Steel Corporation, presented the first paper of the meeting, Thursday morning, entitled "The Cleaning of Blast Furnace Gas." It stated the advantages of cleaning and illustrated various systems, being conspicuously complete in this respect. These included the principal systems of primary dry and wet cleaning in use in this country and Europe. The possible separation of dust by electrical precipitation was touched on. The author emphasized the need from an economical standpoint of cleaning blast furnace gas for use in hot blast stoves and under steam boilers, and that for gas engines the use of thoroughly cleaned gas is imperative.

Duquesne and Other Experiences

In the discussion Mr. Varnes stated that his experience was that wet cleaning did not pay, especially for use in stoves and boilers, and he found that temperatures were higher with the dirty gas. Ambrose N. Diehl, superintendent of blast furnaces, Carnegie Steel Company, Duquesne, Pa., gave some of the results of extensive experiments conducted by his company, which was washing 100,000 cu. ft. of gas per minute. The savings realized were constantly on the increase as improvements were made and conditions learned. It had been found that the efficiency of the stoves was 64 per cent. when using clean gas, as compared with 56 per cent. when using the raw gas, and that the total saving per ton of iron resulting from the use of the clean gas was 0.1591 cent. Stuart B. Marshall, assistant general manager of the Dunbar Furnace Company, Dunbar, Pa., corroborated from his own experiences the statements of Mr. Diehl, though he had not been able to keep as elaborate records. The work of his plant, however, showed greater efficiency and savings resulting from the cleaning of the gas, and a saving of 8 per cent. by using this gas on the boilers alone.

Waste Heat Boilers

Two papers having to do with waste heat boilers were presented. An abstract from one of them, "The Generation of Steam by Waste Heat from Furnaces," by Prof. F. Peter, Royal Imperial Mining Academy, Leoben, Austria, was read by the secretary, Mr. Stoughton. It was a comprehensive presentation of the general design of recent boiler installations in connection with heating, reverberatory and sheet-heating furnaces. He showed that by the addition of a properly constructed boiler the utilization of the fuel energy may be raised from 10 to 60 per cent. and gave the results of a test of a boiler with a furnace for heating small forgings and of a test of an installation provided with a 50-ton open-hearth furnace. In the former the evaporation was at the rate of 2.54 lb. at 5.7 atmospheres and superheated per pound of coal and 35 per cent. of the heating value of the coal was utilized with the gases escaping at 320 deg. C., and the total average evaporation was about 1200 lb. per hour. In the latter the steel production was 9880 lb. per ton of coal and the steam production 40,500 lb. per ton of coal, with the

(Continued on page 936)

The Wider Utilization of Pulverized Coal*

The General Character of the Equipment for the Application to Metallurgical Furnaces—Some Results Obtained

BY H. R. BARNHURST†

The burning of coal in pulverized form has long since passed from the experimental stage to that of practical use. The question to-day is how far this usefulness is capable of being extended and amplified. All the known coals will burn in this form. Those with a low volatile components require furnaces of special construction.

The Long-Flame Method

Pulverized coal may be burned by either of two methods. The first of these may be called the long-flame method. This is a progressive burning of the coal and is used where the character of the work and the form of furnace demands that the flame shall be elongated so that the ultimate burning may be well within the chamber to the end that the heat may be developed in close proximity to the work done and not conveyed by gases from the initial point of firing. This is accomplished by projecting the primary air which carries the fuel into the furnace with high velocity. In this method the air of projection would be less than 25 per cent. of that ultimately required. Additional air must therefore enter from other sources to supply that which is necessary. This additional air may or may not be preheated in order to assist combustion. If preheated by appropriation of waste heat, considerable saving in fuel may be effected. It has been estimated that 4 B.t.u. per degree of preheating (Fahrenheit) is approximately saved per pound of fuel fired when 50 per cent. excess air is admitted.

Fired as described with a high-jet velocity, the complete combustion can only be effected upon the outside of the cloud of fuel entering the furnace. The inside of this cloud is the fuel with less air mixed with it than is necessary to burn it. This forms a more or less elongated cone with its base the pipe of entrance, burning on its surface as it is rapidly shot forward with greater or less velocity. This action is affected also by the greater or less intensity of the chimney draft. The action is somewhat similar to the burning of a candle where the gases evolved from the hydro-carbons fed by the wick burn upon the surface of the gas body as oxygen obtains access to it. I have some doubts, however, as to the genuineness of the claim that this jet of entering fuel as described can be effectively projected beyond a limited distance in any particular direction. With rapidly expanding air without and within the jet, and its corresponding reduction in specific gravity, coupled with the swirls and eddies of currents of varying velocities, it seems to me that little actual control can be had. This air at high velocity should, however, not be directed against the furnace walls. It then is a large and active blow pipe. Confine impingement to the charge. Avoid any impingement before the combustion is complete.

The Short-Flame Method

The second method involves a shorter flame and low velocity. This produces a lazy flame with the least cutting action upon the charge or brickwork. It consists in admitting the air supply entire with the coal at low velocity. Under this condition the fuel burns close to the nozzle and develops through the whole fuel cloud almost instantly. The cone formed is very short in the fuel cloud.

In the long-flame method it is certainly possible to introduce with the fuel all of the air and excess air required for combustion and it is probable that this practice may prevail with further developments. At present such practice seems to develop difficulties in the direction of cutting out the firebrick. Taking up say 75 per cent. of the air from a condition of very low velocity acts as a deterrent or brake upon the current of high velocity due to high pressure, minimizing thereby the destructiveness of blow-pipe conditions. For this reason I believe that use under the conditions of full air supply at high velocity is at present premature. Many serious mistakes in attempts to burn pulverized fuel have been made in the selection of the wrong method. As a matter of fact, however, the short-flame or second method has been the latest developed and from it may be expected a vast expansion of the field of usefulness of pulverized coal.

Furnace Requirements for Burning Pulverized Fuel

The furnace requirements for pulverized fuel are in chief: Cubical capacity for the developed gases that low velocities be maintained. Provision for maintaining the entrance chamber in such a heated condition that deflagrations shall be continuous and thorough.

In the long-flame method the heat of the burning fuel is not effective in maintaining the near-by walls at high temperature. There must be some appropriation of heat for this purpose, by the form of the furnace, by outside accession or by the charge itself parting with its invested heat. As influencing this heated-chamber requirement the nature of the fuel has to be considered. A coal with a large percentage of volatile hydro-carbons will flash and burn more promptly than where the volatile elements are in low percentage. With coal well dried and finely pulverized, excellent firing has been maintained with semi-bituminous coals of 22 per cent. volatile matter, while, of course, those coals high in volatile combustible would give no trouble.

Do not understand me as giving the impression that coal lower than 22 per cent. in volatile combustibles cannot be burned. Far from it. By a special furnace in the construction of which the requirements were recognized, I have burned pulverized anthracite coal of 25 per cent. ash, coke breeze at 15 per cent. and upon one occasion the washings of coal intended for by-product coke ovens, where the analysis showed 52 per cent. ash. The results obtained were in terms of combustible and not of coal fired.

Importance of Drying the Coal

In the preparation of pulverized coal for fuel a thorough drying is an absolute requirement. There should not be over 1 per cent. of moisture in the coal when it goes into the fire. Moisture in the fuel has the effect of reducing the temperature. This reduction will be about 20 deg. C. or 52 deg. F. for each 1 per cent. of moisture entrained. This cannot be overcome by feeding additional fuel with the same percentage of moisture. The loss of heat is about 1.28 per cent. for 1 per cent. of moisture, but if it be considered that this loss applies only to the usable heat above the temperature of the escaping gases, the loss must be considered as increased. For instance, with a given furnace operated at 1500 deg. C., from which the waste gases pass at 900 deg. C., there is an appropriation to the work done of 600 deg., so that the loss occasioned by 5 per cent. moisture or 145 deg. in initial temperature indicates nearly 9.7 per cent. of potential heat put to wrong use.

Fineness Required; Little Danger of Explosions

The pulverization should not be less than 85 per cent. to pass the 200 mesh screen test and not less than 95 per cent. to pass the 100 mesh test screen. At this degree of fineness the coal will all burn suspended in its air supply. The danger of explosion in the use of pulverized fuel is negligible. Only when suspended in air will coal puff. A so-called explosion is simply intensified combustion and occurs only when conditions of mixture with air enable this combustion to leap from one particle to another in progressions. This must not be confounded with the gas explosions in mines or under similar conditions. Even

*Paper read before the Society of Engineers of Western Pennsylvania, Pittsburgh, September 30.

†Fuller Engineering Company, Allentown, Pa.

then an admixture of air is necessary to firing. I have never learned of such a thing as explosions in mills while grinding.

Spontaneous combustion is possible when the coal itself before grinding is subject to such occurrences. Recognizing the conditions leading to this it is easy to avoid them. By avoiding a construction which lends itself to pockets for old deposits or deep bins with heavy pressure at bottom, and arranging to have the bins empty or nearly so, when pulverized coal is kept lively or moving in its bins or conveyors, it does not fire spontaneously. The coal of itself does not burn vividly even if set afire. It only smoulders and cokes.

A proper mill to grind the coal and proper appliances for conveying may be had in which leakage is especially guarded against. There is no occasion for a dirty installation. It is not advisable to store pulverized coal for a long time, say weeks or months, but with a few days storage in tight bins no trouble may be expected.

Feeding the Fuel to the Burner

In the long-flame method of small volume and high velocity, it is not very material to use any especial means of promoting the hoped for mixture of air and fuel. Inasmuch as such a mixture, if as perfectly effective as its inventors designed it to be, would be simply a mixture of the coal with a fractional part of the necessary air, it would seem to be great waste of time to attempt so much for so little result. They all depend upon drawing the fuel into the burner pipe by an induced current. In no current of air passing through a pipe is the velocity of the column uniform, consequently there are eddies and cross currents of intense activity and no man could prevent these currents from producing a mixture which answers all purposes.

When we come to feed pulverized fuel into large pipes in which the air is passing at low velocity, another condition presents itself. This may be met by a construction in which the activity of the eddies and cross currents is vastly heightened so that their purpose may be accomplished in the relatively short distance in which the air and fuel travel together. It is here the proper practice to mix the fuel and its air at a point quite close to the furnace admission, so that as an ignitable mixture they are moving rapidly toward the point where deflagration begins.

Long-Flame Method Adapted to Open-Hearth Furnaces

The long-flame method is that employed in the cement kilns, and its principle is well adapted to the firing of open-hearth furnaces. It is not adapted, however, to the various heating furnaces nor to use under boilers. It is here that the many mistakes have been made and failures met in ill-advised efforts to use the long-flame method in situations where only the short-flame method can be successful. Merely keeping up a fire with pulverized coal does not constitute success. The result sought must be accomplished with a high ultimate economy to be attractive. As component to this economy are repairs, labor and quality of product. In the ultimate analysis the divisor is the product and the dividend is the sum of all expenses.

In burning fuel of any sort, air is necessary in that it supplies the oxygen necessary to combustion. The quantity of air per pound of fuel is well known. The fact that the temperatures resulting depend upon the relations between the air supply and the fuel supply is understood. In practice, however, the means for establishing and maintaining the best conditions have been crude and unsatisfactory. The quality of the coal varies, the percentages of moisture go up or down as may be, the air supply is varied by a damper. In fact the damper seems to have been regarded as the final thing in nearly all systems of fire regulation. It has been a good servant. However, the time has come when closer means assert themselves as necessary to better results.

High Temperatures and Economy Due to Control Possible

As throwing some light upon this subject, I have prepared a table herewith showing the theoretically attainable temperatures due to the combustion of carbon. Beginning with such an air supply as will give the oxygen for perfect combustion with no excess or shortage, the temperature is calculated to be about 2200 deg. C. The table shows the decrease in temperatures, brought about by the admission of excess air in increments of 10 per cent. and that at 150 per cent. excess air, the temperature theoretically falls to 1080 deg. C.

In an ordinary coal fire owing to the varying resistances of the fuel bed there is surely a larger variation in the air supply in different parts of the same fire. This can be seen in the differing intensities. The conditions cannot in the nature of things be identical all over the coal bed on the grates, and when new coal is spread upon the incandescent coal all the conditions are routed. Now with pulverized coal each of the millions of particles is accompanied by its air quota. Not only this, these conditions can be kept constant. The fuel supply is gauged by the revolutions per minute of the feeding mechanism and is variable. The air supply is also under control at known pressure and quantity. The draft is also variable at will. We feel that having factors of control at every point we have made a great step forward toward the high efficiencies pointed out by theory. As a further factor, the fuel is uniform and responsive to conditions. From it, therefore, we are justified in expecting results consonant with its quality and heat potentials.

There are some conditions, for instance ore roasting or nodulizing, where it is desired to mantain a constant condition of operation, neither too high nor too low in temperature, in order to obtain the best results. Also in puddling or heating, it may be advisable to push the furnace at one period and simply hold the heat level at another period. These are conditions of operation which may be thoroughly met in the control which pulverized firing permits.

The Equipment of a Typical Plant

Assuming that the coal is unloaded, we pass it through a crusher to reduce the lumps.

We pass it over a magnetic separator to take out iron scrap which may be there.

We elevate it to dryer bins.

We feed it evenly to a dryer of proper capacity, which delivers it to an elevator pit.

We elevate it to the bins over the pulverizers.

We feed it evenly to the pulverizers from the bins.

We pulverize it to at least 85 per cent. through the 200 mesh and 95 per cent. through the 100 mesh. At this fineness all the coal will burn perfectly.

We elevate it to a pulverized coal bin.

We distribute it to the individual bins over each point of use.

We feed it from the bins to the burners.

We project it into the furnace with a fan blast. Here it is burned.

The story is not complete without speaking of the ash. The most of this goes up the chimney. The balance, a small percentage, depends upon the furnace. Where ash is removed promptly the tendency to coke and stick is reduced. In puddling and heating furnaces it combines with the slag. It has given very little trouble in the checker work of open-hearth furnaces. In boiler furnaces we preferably take care of it through a hopper bottom. There appears to be no difficulties at this point that cannot be overcome by proper provision.

There is no more effect on the brickwork from burning the pulverized coal than would arise from similar heat from grate coal or oil firing. The furnace control and uniformity of results in all parts of the furnace reduces in a marked degree the necessity of overdriving, from which brick troubles may arise. These troubles are at a minimum with short-flame firing and the attendant low velocities. As with gas-firing, the effects upon the brickwork confine themselves to points where the path of the gases is diverted, as through vertical ports from horizontal passages.

Cost of Operation and Some Performance Figures

The cost of preparing the fuel depends upon the quantity handled, the cost of dryer fuel and the cost of the power necessary for operating. I cannot give flat figures for this preparation. The fuel used for drying the coal depends upon the moisture to be driven off, 1 lb. of coal evaporating about 6 lb. of moisture in a properly constructed dryer. One man delivers the coal to a dryer of 6 or 8 tons hourly capacity and looks after its operation. One man can operate mills capable of grinding the same amount of coal and delivering it finished in the bins. The

repairs of dryer and mills will be less than 2 cents per ton. The power for these operations, including conveying and elevating, will be about 17 hp. per ton of product per hour. Due to the fact that all of the heating value of the fuel is developed, serious economies have become manifest over those attainable with raw coal firing or producers.

The consumption of pulverized fuel in actual continuous practice is approximately as follows:

In ore roasting kilns about 7½ per cent. of the charge.

In continuous billet-heating furnaces 168 lb. of fuel per ton of billets.

In puddling furnaces average 1230 lb. This has been reduced in mills running three turns.

Heating furnaces average 525 lb.

Bushelling furnaces average 542 lb.

Fagotting furnaces average 515 lb.

These figures include starting the fires.

Open-hearth steel is produced with about 500 lb. per ton.

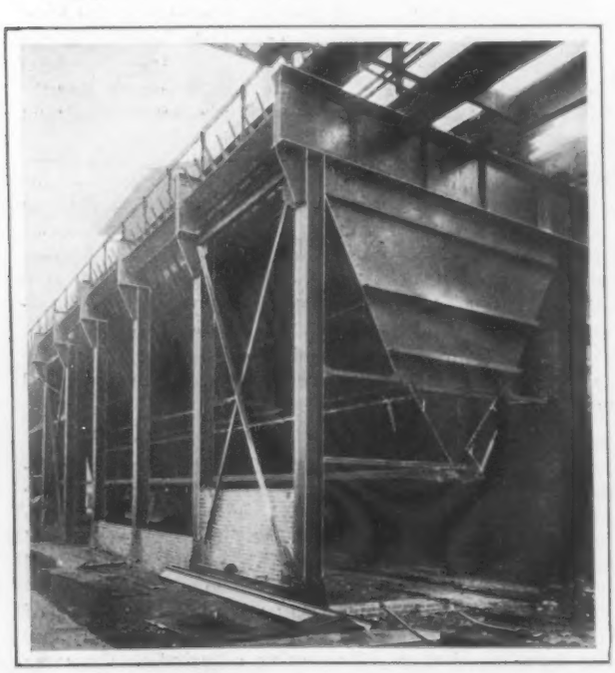
These figures from authentic sources certainly appear to afford large ground for the assumption that pulverized coal has "made good" and has come to stay with us in our efforts toward the best form of conservation of natural resources.

Temperature of Combustion of Carbon with Varying Amounts of Air

With no excess or deficiency	2015 deg. C.	3659 deg. F.
With 10 per cent. excess air	1899 deg. C.	3450 deg. F.
20 per cent. excess air	1794 deg. C.	3261 deg. F.
30 per cent. excess air	1704 deg. C.	3099 deg. F.
40 per cent. excess air	1616 deg. C.	2940 deg. F.
50 per cent excess air	1540 deg. C.	2804 deg. F.
60 per cent. excess air	1469 deg. C.	2676 deg. F.
70 per cent. excess air	1403 deg. C.	2557 deg. F.
80 per cent. excess air	1347 deg. C.	2456 deg. F.
90 per cent. excess air	1294 deg. C.	2361 deg. F.
100 per cent. excess air	1243 deg. C.	2269 deg. F.
110 per cent. excess air	1193 deg. C.	2179 deg. F.
120 per cent. excess air	1150 deg. C.	2102 deg. F.
130 per cent. excess air	1110 deg. C.	2030 deg. F.
140 per cent. excess air	1072 deg. C.	1961 deg. F.
150 per cent. excess air	1037 deg. C.	1898 deg. F.

An Interesting Ore Stock Bin Installation

An installation of ore stock bins at the blast furnaces of the Detroit Iron & Steel Company, Detroit, Mich., recently made by Arthur G. McKee, engineer, Cleveland, Ohio, has a number of new and interesting features. The construction of this type of bins, which is known as the Baker stock bin, includes a steel trestle structure of the usual type. The bin bents support steel stringers for two standard gauge tracks and in addition form the support for two box girders consisting of I-beams with covered plates. From these box girders the bin containing structure is suspended. The installation made includes ten 130-ton bins with standard bays 12 ft. long. They are 27½ ft. in hight from the yard level to the base of the rail and 21 ft. 4 in. in width. The sides have an angle of 60 deg. from the horizontal.



View of the Recently Completed Installation of Baker Stock Bins at the Plant of the Detroit Iron & Steel Company

The method of constructing and supporting the bin proper is the feature of the design. Steel bolts 1¾ in. in diameter and 17 ft. 5 in. long are suspended from the box girders, the bolts being spaced on 18-in. centers. These bolts incline toward the center of the bin, and support a rigidly constructed steel bin bottom. The bin bottoms, which are made in unit lengths of 12 ft., are provided with a continuous line of quadrant gates. These gates are 18 in. in width and are set in pairs, a steel plate diaphragm being provided between each pair of gates. These diaphragms are riveted to the inclined sides of the bin bottom and render them sufficiently rigid to prevent their distortion due to the load of the material contained in the bin.

Steel plate sides and ends are used. The inclined side plates rest against and are supported by the 1¾-in. rods. The end plates are bolted to the side plates, the lower edge of both end and side plates being also supported by the bin bottom. The end plates are also provided with two bars, one on either side, riveted to their lower edges. These bars from a slot in which the end plates of two adjacent bin bottoms are fitted.

The advantages claimed for this form of construction are as follows: The principal elements of a true suspension bin are retained, as the materials used for the support of the bin are in tension, this giving the most economical disposition of the material. The placing of the discharge gates in a continuous line permits the complete discharge of the contents of the bin. The amount of labor and equipment required for the field erection is extremely low, the number of field rivets in the bin structure varying from 18 to 25 per ton weight of structure. All portions of the bin containing structure are made on a unit basis and are interchangeable. The sides, end diaphragms, bottoms and the supporting rods are separately removable. This feature permits the renewal of a damaged part with a minimum of labor and expense.

Three installations of this type of stock bin are now being made in addition to the one placed in operation in Detroit. Arthur G. McKee is the licensee of the Baker bin and is the general contractor for all the installations now being made. Bin designs embodying the suspension principle as described and with concrete sides, ends and bottoms indicate the possibility of this form of construction for bins for other material such as coal, stone, sand, etc.

In addition to the bins one 80,000-lb. transfer car and one 130 cu. ft. scale car, designed and built by Mr. McKee, have been installed at the Detroit furnaces, supplementing the two scale cars and one transfer car that had been in use, and a new double discharge steel coke bin feeding directly to skip cars has been erected.

Abatement of Locomotive Smoke

The Pennsylvania Railroad Company is distributing reprints of a paper on "The Abatement of Locomotive Smoke" by D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West of Pittsburgh, which was prepared for the International Society for the Prevention of Smoke. This paper discusses the use of air jets and gives the results of tests made at the locomotive testing plant installed by the Pennsylvania Railroad Company at Altoona, Pa. The conclusions reached by these tests have been favorable to the use of air or steam jets. Since the completion of these experiments in March of this year, about 30 locomotives on the Pennsylvania Lines and many more on the other lines used in switching and yard service have been equipped with air jets, the design being modified to meet the conditions of each type of locomotive.

The paper also states that for the past nine years the Pennsylvania Lines West of Pittsburgh have been working to develop a mechanical stocker for locomotive use and the results so far have been sufficiently satisfactory to warrant its application to a total of 300 locomotives, of which 215 are at work. This device has proved the most promising yet installed for the reduction of smoke from a locomotive using bituminous coal; in fact, under favorable conditions, the smoke is practically eliminated. The problem of maintaining and satisfactorily operating such apparatus, with various kinds of coal, and teaching many men how to handle such locomotives to the best advantage, is stated to be still in progress of solution.

Foundry Practice Is Increasingly Scientific

The Meetings of the Foundrymen's Associations at Chicago Show Marked Progress, Both in the Intensive and Extensive Development of the Founding Art

That the business of founding has become the science of founding is the strong impression left by the meetings of the American Foundrymen's Association and of the American Institute of Metals, held in Chicago from October 14 to 17. The many directions in which investigation, scientifically conducted, is being brought to bear on foundry practice, both in molding and metallurgy, was evidenced by the variety of topics provided in the programme. In this respect the Chicago meetings were among the best ever held. Moreover, the exhibition of foundry equipment and machine tools was in its extent and variety a striking commentary upon the practical results of the discussions and research of the past year and those immediately preceding. If certain questions may be said to have received more attention than others during the meetings, the training of apprentices and the subject of industrial education may be mentioned. The papers covering the question of the quality of cast iron most desirable for automobile cylinder work were also followed by extended discussions, having to do more particularly with the influence of silicon in the iron and the possibilities of the use of charcoal as well as coke iron.

New Officers

The officers of the American Foundrymen's Association elected for the ensuing year were as follows:

President, Alfred E. Howell, Phillips & Buttorff Mfg. Company, Nashville, Tenn.

Vice-presidents: R. A. Bull, Commonwealth Steel Company, Granite City, Ill.; H. A. Carpenter, General Fire Extinguisher Company, Providence, R. I.; S. B. Chadsey, Massey-Harris Company, Ltd., Toronto, Ont.; G. R. Lombard, Lombard Iron Works & Supply Company, Augusta, Ga.; T. L. Richmond, Buffalo Scale Company, Buffalo, N. Y.; T. W. Sheriff, Sheriffs Mfg. Company, Milwaukee, Wis.; J. J. Wilson, Cadillac Motor Company, Detroit, Mich.; Walter Wood, R. D. Wood & Co., Philadelphia.

Secretary-treasurer, Dr. Richard Moldenke, Watchung, N. J.

The meeting of the Associated Foundry Foremen developed into one of unusual interest through a discussion of foundry problems with the aid of blackboard sketches. The officers elected were: President, S. V. Blair, Kalamazoo Stove Company, Kalamazoo, Mich.; vice-president, H. M. Martin, Davis Foundry Company, Hornell, N. Y.; secretary-treasurer, Robert B. Thompson, Buffalo Pitts Company, Buffalo, N. Y.

Honor to the Senior ex-President

The last session of the American Foundrymen's Association was given historical distinction by the presentation to Past President Seaman, the first president of the association and president of the Seaman-Sleeth Company, Pittsburgh, a splendid hammered silver loving cup and salver, appropriately engraved. The presentation was made by the newly elected president, Mr. Howell. In the giving of the token and in the words of Mr. Howell was reflected the substantial foundation upon which the association is built, the many personal ties of affection and esteem of which the association is the connecting link. Mr. Seaman responded with much feeling in accepting the cup, which he termed a gift from his "boys," and expressed the hope that when he, the oldest living ex-president of the association, must yield that place to another, this cup might pass to his successor and so be handed down.

The entertainment features, which as planned were mentioned in a previous issue, were entered into very generally by the visitors and were made most enjoyable. More than 200 ladies were guests at the luncheon and theater parties arranged, and the luncheon provided for the men on Wednesday proved a welcome convenience. The banquet on Thursday evening was a pronounced success, approximately 325 men attending, many attracted, perhaps, by the announcement that the programme admitted of no speechmaking. During the informal dinner, orchestra, quartette and cabaret alternated with musical and other sounds that early created an enjoyable atmosphere. Following the banquet, a vaudeville performance of several numbers was staged. In appointments, programme and general "get together" spirit the occasion fittingly closed the convention.

Next Year's Convention

The place of meeting for next year was left to the executive committee to decide and announce later. Invitations were received from cities in all parts of the country but indications point to Chattanooga or Boston as the likely location. The Foundry & Machine Exhibition Company adopted a resolution expressing its intention to alternate each year between the East and West in the holding of its exposition, in so far as circumstances and the ability to secure suitable accommodations would permit.

The American Foundrymen's Association

General Electric Company Apprenticeship

In the report of the first day's sessions which appeared in the October 16 issue of *The Iron Age* brief mention was made of the address by M. W. Alexander in which he told of the trades apprenticeship system of the General Electric Company. This address was one of the most interesting of the convention, and in connection with it stereopticon views of the work done at Lynn, Mass., were shown for the first time in this country. As a requirement for entrance to the course the applicant for instruction in the mechanical trades must have completed a grammar school course, while apprentices in drafting, inspection, designing and similar work involving some engineering are usually boys out of high school. Since October 1 it has been required by law in Massachusetts that no boys or girls be employed under the age of 16 years. The applicant enters into a regular form of contract with the company, which is signed by himself and his father or guardian, the contract providing for a period of service at stipulated wages. In the machine and pattern shops the term is four years, in the foundry two and three years, in the drafting room three years. To begin with, the wages in the machine and pattern shops are $4.50 per week and in the foundry $7.75 per week, the intention being to have the wages liberal enough so that no bar is placed in the way of apprentices who must support themselves or contribute to the support of others. At the end of the course a diploma is given which names each subject in which the apprentice has made a passing record. Where the apprentice completes all of the subjects assigned the diploma is marked "Complete Course," the idea being to avoid handicapping the apprentice by indicating on the diploma subjects which have not been satisfactorily passed. The initial work at which the boy is set is especially designed to bring him immediately in contact with the machinery and materials with which the trade he seeks to learn are concerned. This is a part of the two months' trial period through which each applicant passes and during which he is very closely observed to determine whether he is naturally adapted to follow that particular trade. If native ability in that direction seems lacking a change is made.

Approximately the first half of the entire apprenticeship period is spent in the apprenticeship training shop, the last half being spent in the regular shop department. It sometimes happens that the apprentice, when he goes out into the shop from under the supervision of the training room,

slows down in speed and efficiency. Where this occurs the apprentice is sent back to the training room where his weaknesses are bolstered up and it is the experience that rarely does the apprentice relapse again. Each day one and one-half hours are devoted to class-room work and for this time the apprentice is paid at the regular rate. Knowing that his time in the class-room is being paid for, the boy is ordinarily eager to take advantage of this respite from the shop work. In turn, the increased speed and efficiency of the boy when he comes back to the shop more than pays for his time in class.

The scheme of supervision adopted in the training room has as a distinctive feature the working of two boys on each job as a team. The one boy has attained the requisite knowledge and skill on the job in question. Before he can advance to another piece of work it is required of him that he be able to instruct one of the other boys who is just learning. The team is thus made up of teacher and pupil. The teacher gives his best instruction, so that he may advance himself; the pupil puts forward his best effort so that he may get rid of his teacher, and what is more important the impatience of the teacher with the slow pupil results in the quickest possible detection of the laggard or incapable boy. With this system in operation it has been found possible to conduct the work of the entire department with one superintendent and six assistants. The initial equipment of the training shop consisted of a few machines no longer fit for service in the shop. These were repaired by the apprentices and placed in operation. Subsequently new machines were designed and built by the apprentices and by pointing out to the new boys actual machines built by the others in the shop incentive is given in tangible form. The class-room instruction is largely in the direction of the mathematics and mechanics directly applicable to the work in the shop, such as arithmetic, some algebra, geometry and trigonometry, weights and strengths of materials, prime movers, power transmission, load stresses, free hand sketching and the design of jigs, fixtures and tools.

Following Mr. Alexander's talk, P. Kreutzpointner, Altoona, Pa., told of the progress made by the committee of which he is chairman in fostering industrial education in the schools. It was also pointed out by Mr. Hillis that one of the greatest difficulties was the securing of teachers properly trained for the instruction of apprentices.

Automobile Cylinder Castings

The first paper on Wednesday morning was presented by H. B. Swan, Michigan Motor Castings Company, Detroit. Mr. Swan's paper, which is given practically in full elsewhere, discussed in its introduction the exacting requirements of automobile cylinder castings, while the main portion was an explanation of a series of photo micrographs thrown on the screen and made from a large number of samples of different brands of pig iron. A general discussion followed during which the influence of charcoal iron in the mixture as against a straight coke iron charge was commented upon. The use of charcoal iron for automobile cylinders is known to have increased very materially in the past year. It was also stated that the usual coke iron for cylinder work runs high in silicon which probably contributes to the machining qualities of a casting, but that the importance of a high silicon content or in fact any particular silicon content was no longer paramount. Experiences were cited where castings made from iron in which the silicon ran between 0.02 and 0.025 per cent. were decidedly gritty. Dr. Moldenke suggested that this grittiness arose from the presence of sulphur and foreign particles mechanically incorporated in the iron. He suggested that where time and cost permitted, the sulphur content of the iron could be reduced one-half by allowing the iron to stand very hot in the ladle for a period of 20 minutes during which a complete formation of the manganese sulphides would take place, these rising to the surface immediately below the slag. By drawing the iron off at the bottom a very clean and smooth casting can be secured.

Electric Steel Castings

The paper on "Electric Steel Castings" by F. T. Snyder, Metallurgic Engineering Company, Chicago, covered the electric furnaces of limited capacity suitable for the making of small steel castings. The importance of the electric furnace for this work is based upon two established facts—that under ordinary conditions steel in small quantities can be poured from an electric furnace at a decidedly lower total cost than from fuel-heated furnaces, and, also that it is readily possibly to secure a better quality of steel in electric steel castings than in castings poured from fuel-melted steel. It was shown that on the basis of current at 1¼c. per kw hour, a price generally available where central station power can be bought, the total cost of electric melted steel compares very favorably with open-hearth or converter steel. The discussion following brought out general inquiry as to the necessity of repairing, the manner and ease of charging, and the question of types of furnaces. It was pointed out that the metal loss in the electric furnace can be brought down to a practically negligible point as compared with losses varying from 17 to 20 per cent. where fuel is used for melting. A number of samples of electric steel were shown.

The paper "The Pattern Shop, with Relation to the Steel Foundry," by E. R. Swanson, Granite City, Ill., outlined the arrangement and equipment of an ideal pattern shop more especially adapted to the requirements of a steel foundry making large intricate castings for passenger and locomotive equipment. The layout was considered from the standpoint of accessibility to the machines and transportation of materials. The guarding of dangerous parts of the woodworking machinery was given particular attention in the interest of safety. It was pointed out that the increased use of dry and sand cores in the making of intricate castings in quantity, to obviate the making of a cope, a plan that is being followed in many places where stripping plate and jarring machines are in service, greatly increases the demand upon the pattern shop and the core room.

The paper of R. A. Bull, Granite City, Ill., on "Some Difficulties in Pouring Steel Castings," recited the troubles encountered at the nozzle of the ladle in pouring and how to avoid them. In the discussion following Mr. Ploehm, of the Bettendorf Axle Company, told of his investigation of nozzles and stoppers and of the astonishing variety of standards for size and taper of hole. He made a strong argument for the adoption of a standard for nozzles and stoppers, pointing out the great disadvantage under which the smaller user of nozzles now labors. Either he is forced to buy in small quantities at high prices, or he must run the risk of deterioration during storage. Mr. Ploehm also called attention to the prevalence of defective nozzles as the result of poor drying by the brick maker. In this connection Dr. Moldenke moved that a committee be appointed to investigate and report on steel castings shop standards and it was so ordered.

The remaining papers of the morning session were read by title, with some explanations by the secretary. The paper of W. M. Carr, Erie, Pa., on "Detachable Open Hearth Furnaces," presented some of their advantages based on recent experience in a foundry where Mr. Carr operated some of them. He showed how steel could be advantageously made in them, as well as a good grade of cast iron.

Annealing Malleable Castings

E. L. Leasman's paper on "The Annealing Process for Malleable Castings" presented results of an extended investigation of this subject on four principal lines of study embracing the effect of packing materials, annealing temperatures, times of annealing and times of cooling. The work embraced chemical and extensive microscopical data from which the following general conclusions are deduced:

1. The nature of the packing does not affect the interior structure of the iron; while the surface or "skin" effect may vary from pure ferrite to a pearlitic structure.

2. Packings like rolling mill scale and fire clay give as good results as any and have the added advantage of being cheap. Of these two packings, fire clay would be the better because it packs closer and more effectively prevents access of the oxygen of the air to the specimen or casting.

3. Castings may be malleableized without the use of any packing, but a good muffle furnace should be used to keep down the oxidation of the surface of the castings.

4. Air-tight containers or those as nearly so as possible should be used to keep down oxidation effects.

5. A temperature of 1550 deg. to 1650 deg. F. has proven to be best temperature to use for iron of the analysis previously given and under the conditions tested. This range insures a complete breaking down of the carbide.

6. A temperature below 1400 deg. F. did not cause a complete breaking down of the carbide structure; and even prolonged heating would not have produced a malleable structure when as low as 1000 deg. F.

7. At temperatures of 1400 deg. to 1500 deg. F. there is danger in not getting a good malleable structure in those castings farthest from the source of heat and the oven walls.

8. The above conclusions are understood to be based upon annealing small specimens in small ovens, in which temperature variations are more marked than in the large, almost uniformly heated ovens of commercial work.

9. The time of cooling from the annealing temperature to 1200 deg. F. is the most important variable in the process.

10. A rapid rate of cooling, even when sufficient heat and time of annealing is used, forms a pearlitic or "steely" structure.

11. The time of cooling to 1250 deg. F. should be about 42 hours. The cooling below this temperature may be rapid and not materially affect the malleable structure.

12. A period of from 36 to 42 hours gave the best results for this range of temperature.

13. An experiment not herein recorded showed that a good malleable structure could be obtained in 20 hours, using a temperature of annealing of 1800 deg. F.

14. The period of annealing is entirely dependent upon the temperature of annealing and the type of furnace used.

The Carnegie Institute in Industrial Education

The papers scheduled for the morning session on Thursday were the following:

The Need of Standard Specifications for Cast Iron, by R. S. MacPherran, West Allis, Wis.

Memoranda on Automobile Cylinder Founding, by Robert Crawford, Detroit, Mich.

Core Test and Specifications, by H. M. Lane, Detroit, Mich.

Testing Molding Sands Under Commercial Conditions, by Prof. E. A. Johnson, Boston, Mass.

Vital Points in Foundry Practice, by J. J. Wilson, Detroit, Mich.

The Carnegie Institute of Technology, by Dean C. B. Connelley, Pittsburgh, Pa.

"Put Your House in Order," by Frederic A. Parkhurst, M. E., Detroit, Mich.

The Need of a Common Sense Cost System for the Foundry, by E. W. Riker, New York City.

ALFRED E. HOWELL

New President of the American Foundrymen's Association

Most of the papers read were attended with brief discussions, while the greater part of the session was given up to a consideration of the work of the Carnegie Institute of Technology in industrial education. With great earnestness and enthusiasm, Dean Connelley presented a general view of the work and the method of teaching this institution affords, illustrating his address with lantern slides. The paper by J. J. Wilson, of Detroit, which will be printed later in full, was deferred until the afternoon. With emphasis Mr. Wilson brought out some of the principles that are absolutely requisite to the successful conduct of the ordinary foundry.

Henry M. Lane, in discussing "Core Testing and Standards," stated that it is quite necessary to have some method of testing the strength of cores and comparing them. The paper described one or two core-testing machines and stated that the result of the work thus far done seems to indicate that the tension test is far more accurate than the transverse test, in judging core values.

R. S. MacPherran, in his paper on "Cast Iron Specifications and Inspection," made a plea for more uniformity in the inspection of iron castings and in making specifications. Various specifications call for test bars of different sizes, some for transverse bars or for tensile only, and some for both. The minimum breaking load and the tensile strength demanded vary. Much should be left to the judgment and experience of the manufacturer. The adoption was urged of the so-called "arbitration bar" which forms the basis for the specifications adopted by the American Society for Testing Materials. Something to settle the status of so-called "semi-steel" was urged.

Powdered Coal in the Foundry

On Thursday afternoon, W. S. Quigley, New York, gave an illustrated address on "The Use of Powdered Coal as Fuel." The paper in its introduction dealt with the general fuel situation and the circumstances that have created a demand for coal in pulverized form. The apparatus and method of preparation for burning this fuel were also described and figures presented covering operating costs and efficiencies. In the accompanying stereopticon views typical plant installations were illustrated.

The paper of W. S. Hoyt, Chicago, on "Oxy-Acetylene Welding and Cutting" was presented by Mr. Harding, of the Oxweld-Acetylene Company. Following a statement as to the remarkable development of the welding torch and its importance, the paper was largely an explanation of an unusually interesting and instructive series of views of repair work accomplished through the use of the welding torch.

Accident Prevention

"Recording Memoranda on Accident Prevention" was the subject of a paper by Thomas D. West, Cleveland. He referred to the two classes of accidents: those which could be prevented by the exercise of judgment by workmen, and those which could not be foreseen or prevented. For every accident of the latter class, he said, there are many of the preventable ones. The development of safety devices, though doing great good, has not, in the writers opinion, reduced the percentage of accidents to any great extent, because the personal factor has not been properly emphasized. Mr. West suggested that plant superintendents should keep a record of any circumstance or situation which might have led to accidents, and indicate how trouble could be forestalled in any repetition of the same circumstances. He referred particularly to cases in which accidents had been prevented, though perhaps only narrowly averted. Such information would show of what safety devices a plant stands most in need.

The paper referred to the increase in the rates of insurance for plants in which there are extra hazards, under the recent legislative extension of accident liability. It was urged that everything possible be done by industrial establishments to keep their superintendents alive to the importance of eliminating the chances of accident. While accident prevention and safety devices should be adopted wherever possible, these should not exclude the eternal vigilance required from every individual foreman or workman. Mr. West will deal with the phase of the accident prevention problem referred to in his paper, in one of the 40 chapters of a new book he is bringing out on "Managing Men and Work." In introducing his paper he spoke of the American Anti-Accident Association which he organized at Sharpsville, Pa., about five years ago. Later he called a meeting in New York City, at which representatives of iron and steel works, insurance companies and various organizations participated, the object being the creation of practical interest in accident prevention in all industries.

President Miles spoke of the work that is being done in almost every direction for the furthering of safety, mentioning in particular the investigations by the National Founders' Association. On motion it was decided to appoint a Committee on Safety for the association, and President Miles named Mr. West as chairman with power to select his associates.

Business Session

With the completion of the programme of papers, the report of the Nominating Committee was received and accepted, as indicated above. President Howell was

escorted to the chair and presided through the remainder of the meeting.

On a motion made by J. S. Seaman, the retiring president, Mr. Miles was made an honorary member of the association. Resolutions were adopted in which the thanks of the association was conveyed to all who had co-operated in the entertainment of the convention and in which the action of the Executive Committee on various matters in the past year was approved. The presentation of the loving cup to Mr. Seaman followed, as referred to above.

After the reading of invitations from various cities for the next year's meeting and their reference to the Executive Committee, the convention adjourned.

The American Institute of Metals

The meeting of the American Institute of Metals was held in the LaSalle Hotel, the headquarters of the allied foundry associations. Three separate forenoon sessions were held, beginning Wednesday. They were presided over by President L. W. Olson, Ohio Brass Company, Mansfield, Ohio. On Tuesday the Institute held joint sessions with the American Foundrymen's Association.

Report of Secretary-Treasurer

At the first joint session W. M. Corse, Lumen Bearing Company, Buffalo, N. Y., presented his annual report as secretary-treasurer, which in part was as follows:

Our membership this year has shown a disposition to mark time, which I believe is in line with the general industrial condition. On July 1, 1912, we reported 310 members; on July 1, 1913, 274. This is accounted for by the fact that the usual number of people dropping out or dropped for nonpayment of dues, etc., were not replaced by new memberships. At the present time we have a membership of 277.

I believe the most important undertaking of the year has been the co-operative work in connection with the Brueau of Standards and the Bureau of Mines at Washington. Both of these bureaus have been doing splendid work in connection with subjects that interest us particularly, and it is with great interest that we shall hear the reports of the committees which co-operate with them; also the statements from the officials of the Government bureaus themselves. It seems to me that this kind of work will do more to benefit our membership at large than almost anything that we could undertake. The testing out of the various kinds of furnaces, for instance, which has been undertaken by the Bureau of Mines, is an extremely valuable piece of research. The standardization of the test bars, which all of us use, undertaken by the Bureau of Standards, is also a great step in advance, for when this is decided the determination of the properties of the various alloys will become much simpler. It has been suggested that our committee, which is co-operating with the Bureau of Standards, form part of a general advisory committee for this same purpose, this larger committee to be composed of our members, those from the American Society for Testing Materials, the American Chemical Society and the American Institute of Mining Engineers.

Our bound volume, which was issued recently, is one of the best contributions to the literature of non-ferrous metallurgy that has so far been issued by our Institute. It is over double the size of our former volumes and contains much more items of interest than usual. For instance, the bulletins which appear from time to time will be found in the back of the volume, together with the list of members and officials of the society.

In looking forward to the present convention, it gives me great pleasure to add my word of appreciation of the work done by the Papers Committee, of which Dr. H. W. Gillett is chairman. I think you will agree with me that the programme this year is an unusually strong one.

The Year's Progress in Metals

The first paper presented was the report of the official chemists. This stated that the year which has elapsed since the last annual convention has not been so prolific of new processes and inventions as some previous years. Attention was called to the fact that with the increase of consumption and the decrease in production in some lines there has arisen a situation which demands the elimination of waste in production, utilization of by-products and the application of new processes and materials. Together with this change in business conditions there has been a growing appreciation of the importance of applying technical knowledge to manufacturing conditions. This change has been marked in the non-ferrous metal industries as is shown by the patenting in the year of many new combinations of materials and the utilization of rare metals, which until recently were scientific curiosities rather than materials of commerce. One of the most interesting has been the manufacture of boronized copper, the process perfected during the year being mainly directed to the production of cast copper mechanically sound and of high electrical conductivity.

The report referred to some of the most important new alloys. One of these, a white metal alloy composed of copper, nickel, iron and aluminum, was patented in England, the mixture being unique, as it contains 50 per cent. of iron. This alloy was referred to in the discussion, but members appeared to know little about it. President Olson thought the presence of so much iron would make this alloy hard to handle. Another product referred to was an aluminum-zinc alloy known as "McAdamite," which has recently come into prominence. E. B. Horne, foundry superintendent of the Packard Motor Car Company, Detroit, said that he had experimented with this alloy in making transmission cases. At first he had considerable trouble because of shrinking, but after he paid careful attention to the chilling he got very good results.

A paper on "Internal Strains in Bronze Castings" was presented by J. E. Howard. He referred at considerable length to numerous tests he had made at the Watertown Arsenal and illustrated his paper with slides. H. W. Gillett of the Bureau of Standards, said that the foundations laid in Mr. Howard's paper were very important. He stated that it was probably difficult for foundrymen to realize the significance of these tests, but if merely peening rolled brass bars would set up internal strains and materially affect strength it could be realized to what extent internal strains must affect brass castings. To reduce internal strains to the minimum will necessitate better designed patterns, or possibly the annealing of castings to eliminate the strains, or perhaps the same results could be obtained by leaving castings to anneal in the molds.

An interesting paper on "The Work in Metals at the Bureau of Standards" was read by Dr. D. K. Burgess. In connection with it he presented a large number of lantern slides showing tests made and various apparatus and machines used by the bureau in testing material.

Nomenclature of Alloys

"The Nomenclature of Non-Ferrous Alloys" was a subject that aroused considerable interest. Papers on this subject were presented by Dr. Burgess and by C. P. Karr, associate physicist of the Bureau of Standards, Pittsburgh. Mr. Karr said that the confusion of names given non-ferrous metals is increasing and some system of classification that is simple, scientific and flexible should be undertaken. Many manufacturers supply names of their own coinage to their products and many give products trade names, which mean nothing to the consumer. Many terms are misnomers, but some of these have been established so long that it will be difficult to dislodge them. He suggested a tentative scheme of classification, which he summarized as follows:

Bronze—A copper-tin binary alloy with copper as the chief component.

Brass—A copper-zinc binary alloy with copper as the chief component.

Composition—An alloy of two or more metals with copper as the chief component.

Subdivisions:

Bronze composition—A binary alloy of copper and tin with one or more other variable components, but in which tin is the chief minor component or furnishes the compound with its most important physical property.

Brass composition—A binary alloy of copper and zinc combined with one or more other variable components, but in which zinc is the chief minor component.

Lead composition—An aluminum and other compositions follow the same general suggestion.

White metal alloy—A binary combination of any two white metals.

White metal composition—A binary alloy of two white metals combined with one or more variable minor components, such as Britannia, pewters, fusible metals and soft solders.

Anti-friction and bearing metals—These may be divided into two or three classes, according to their composition. The white bearing or anti-friction metals are all either white metal alloys or compositions; all others are either brasses or bronzes or their corresponding compositions.

Noble metal alloys—Binary combinations of the noble metals.

Noble metal compositions—Binary alloys of the noble metals in combination with one or more other noble or base metals as minor components.

Amalgams—Alloys of mercury with various metals.

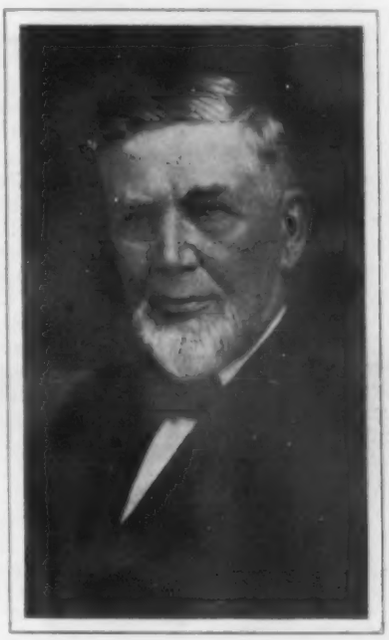
Special alloys—Alloys known by distinctive names, yet by their composition may be placed in one of the above groups.

Trade names—Alloys whose names are trademarked, yet may be classified in one of the above groups if their composition be known.

Binary alloys—Exclusive of bronze and brass these may be placed in a class by themselves, the chief constituent forming the qualifying title, such as cupro-vanadium, cupro-tungsten, etc.

Miscellaneous and misnomers—All of the so-called nickel-silver alloys may be classified as cupro-nickel alloys or compositions according to the number of constituents they possess.

In the discussion Mr. Gillett said that there is some excuse for some of the names that now have strong commercial standing and the institute should go slow in advocating the entire abandonment of the present nomenclature. In his opinion the problem now is to do away with names of alloys that are misleading. He asked if it would not be possible for the Bureau of Standards to prepare an official list designating alloys by numbers and also giving their popular names. He thought it would be a distinct aid if alloys carrying certain physical and chemical qualities were given numbers as well as their common trade names. Mr. Karr replied that the Bureau of Standards would hesitate to take up the matter of classification, but suggested that manufacturers take up this matter in conjunction with the bureau. The matter was referred to the advisory committee to work in connection with the Bureau of Standards and report at the next meeting.



J. S. SEAMAN

Senior Past President of the American Foundrymen's Association, Whose Long Service Was Recognized by the Presentation of a Loving Cup

The Man Factor in the Brass Foundry

"The Brass Foundry of the Future" was discussed in a paper by C. P. Karr. He called attention to the haphazard way in which much work is now done in many of the brass foundries. Today, as a rule, the furnaceman is simply a melter of scraps, a compounder of junk and any old metal that is wheeled up to him. He declared that the success of the brass foundries of the future would depend more upon the training of the man in physical and metallurgical science and his ability to apply his knowledge than upon the machinery employed, desirable though it may be as an accessory to facilitate the production of castings. In other words, the greatest possible factor for success lies in the development of the man himself.

The Year's Study of Melting Problems

A brief report of the co-operative work of the Bureau of Mines with the American Institute of Metals, prepared by Prof. C. L. Parsons, of the Bureau of Mines, was read by Mr. Gillett. He referred to the problems that were presented at the last meeting. One of these was the development of a suitable pyrometer for molten brass. He stated that they had been working on this problem quite strenuously, but with little results. Many ideas have been worked on and eliminated, and there were still six ideas to work, with new ones coming up. He did not think the problem was one that could not be solved, but was not hopeful of any definite results in the present year. Another problem is the development of an electric furnace for brass melting. Electric furnaces for brass work were largely theoretical two years ago, he said. Last year there were quite a few on paper. While so far there are almost no results that can be put in concrete form the developing work is still going on and he believed they were on the right track and would have something more definite to report next year. In reply to a question on the subject of pyrometers Mr. Gillett stated that the temperature of brass can now be measured cheaply but not accurately. It can be measured accurately, but only with expensive equipment.

Two other problems were brought up at the 1912 meeting. These include a comparative study of brass furnaces with particular reference to fuel efficiency and loss of metal in melting and a study of the precautions to be taken for health and safety in the brass foundry. Mr. Gillett stated that he had completed a comprehensive bulletin covering these problems, giving over 300 sets of data in the performance of 21 distinct types of furnaces in commercial use and compiled from information received from 280 firms and from visits to 75 foundries and rolling mills. The bulletin is so comprehensive no attempt was made to present a summary of the conclusions, but the bulletin itself will be issued shortly.

Scientific Management in the Foundry

The greater part of the Thursday session was devoted to the general topic of scientific management. A lengthy interesting discussion followed the presentation of three papers. These papers were "The Efficiency Engineer in the Foundry," by E. A. Barnes, general superintendent of the Ft. Wayne Electric Works of the General Electric Company; "Preparations for Scientific Management in Our Plant," by Secretary W. M. Corse, and "How Scientific Management Works in Our Plant," by C. B. Bohn, general superintendent of the Aluminum Castings Company. Mr. Barnes said that the introduction of motion study or efficiency engineering in its broadest sense would not be practical in very small foundries, and in fact no hard and fast rules could be laid down to govern any considerable proportion of foundries; but the fact remains that there is room for improvement in the methods used in all foundries. His plan of attacking the problem of efficiency in the foundry is to develop a man from within the organization rather than to introduce some outsider who is unfamiliar with existing conditions. There are hundreds of labor saving devices, but in order that good results can be obtained from their installation, it is necessary that the devices be individually fitted to the particular shop in which they are installed. To secure efficient devices requires special selection and here is where the efficiency engineer can be of great value. After he has applied his scientific knowledge and experience in eliminating all lost motion and other wastes in the operating end of the business, his time can be profitably devoted to a study to a cost of production. The efficiency engineer must be a happy mixture of a theoretical and practical man. Mr. Corse stated that he believed that before scientific management, as it is popularly known, can be introduced in any plant, the conditions in the plant should be standardized so that the proper method of piece work, premium plan or bonus system can be installed. That plan was followed in the plant of the Lumen Bearing Company with which he is connected. The result of the installation of various equipment was the direct increase in the number of pounds of castings produced per man. He said that before introducing new systems of pay it is necessary to standardize the equipment, the system of following the product through the plant and the method of keeping the cost. In other words, one cannot introduce scientific management successfully without first modernizing the equipment and processes. It seemed to him that the foundry problem, particularly is one of motions and the foundry should lend itself to a study of these motions scientifically, much more than some other kinds of business. Mr. Bohn said that before he investigated scientific management he thought that it would work out well in every business but his own. After he got through with his investigation he

came to the conclusion that scientific management would in reality work out better in the foundry than in any other business. Under scientific management his company had increased production, improved the quality of castings and cut the cost. A great deal, he said, depends on getting proper men to install the system.

DISCUSSION

President Olson opened the discussion by stating that the subject sounded technical, but at the bottom scientific management was the application of principles that all foundrymen know and understand. The thing to do is to watch critically the movements of several men and compare one man's movements with another's. Unnecessary movements must be eliminated and the process must be standardized whether working with a tub or molding machine. Scientific management is not speeding up, but making work easier by eliminating movements. He thought a foundry could save money by adopting methods for reducing movements rather than by the installation of up-to-date equipment that is improperly handled.

Mr. Gillett saw great possibility in scientific management in the foundry. He said that the industry was in the first stage of this advancement and that very few foundries were running under full scientific management. He believed there were greater possibilities in time saving than in all other savings put together. He referred to the fact that at the plant in Detroit with which he was formerly associated it was impossible to get the men to make more than 100 molds a day before scientific methods went into effect. However, since that time the production per man has been increased by 50 to 60 molds because the men realize that their wages would not be cut with the increased production. Mr. Corse said that in his shop the foremen as well as the molders are paid a bonus. The foreman gets a bonus increasing geometrically for keeping defectives below 15 per cent., and also a bonus for high production. F. H. Schutz, of the H. Mueller Mfg. Company, Decatur, Ill., said that he paid a bonus every three months. He believed that plan was better than paying a weekly bonus, as a man for some reason might fall behind one week and would make it up the next. His molders are given their full pay if their work falls below the regular amount, but if that condition exists for nine months the man is let out.

Robert Wallace, foreman of the brass foundry of the National Cash Register Company, believed that if men are not in sympathy with their employers, scientific management would not amount to much. His company encouraged men to cut out motions and get the maximum production by guaranteeing the price. After the piece work price is set it is guaranteed for a year. If found too low it may be increased, but it is never decreased.

Mr. Karr believed that the whole question was one of the mental attitude of the molder. To get him in sympathy with scientific management he thought that a summary of the papers of the discussion that was coming out ought to be prepared and sent to the men themselves. Later the institute adopted Mr. Karr's suggestion by authorizing the publication of a summary of the discussion and papers for distribution.

Mr. Gillett declared that a point of vital importance was inspection along the whole line. Under scientific management every operation should be inspected so that if there was an error it would not creep into the second piece. Phillip Mueller stated that his company was working out plans, which would be adopted shortly, to give prizes to its men for devising improvements in tools and operation. In reply to a question Mr. Gillett said that in the matter of scientific management the small shops had an advantage in that a foundryman with only a few molders knows his men and can put scientific management into effect almost immediately and secure quick results. In large shops it takes a long time to work out a system.

Standard Method of Cost-Finding

It was decided to appoint a cost committee to work out a standard basis of costs in connection with a similar committee of the American Foundrymen's Association. This committee is to report at the next meeting.

A paper on "The Boiling of Metals" was presented by Prof. J. W. Richards, of Lehigh University. A paper on "Core Room Economies" by O. F. Flumerfelt, H. M. Lane Company, Detroit, Mich., was read by title. It pointed out various ways by which leaks in profits could be stopped. The selection of the proper sand and binder adapted to each class of work has resulted in great savings in certain cases. The choice of the proper mixture of sand is also vital in effecting economies; baking temperatures play a very important part, and it is surprising to what extent the complete mixing of the sands is neglected, resulting in defective cores. It is the author's opinion that the greatest savings in foundry costs in the next few years are going to be made by giving proper attention to the coreroom.

At the Pittsburgh convention a committee was appointed to consider the advisability of getting up a uniform analysis report card. This committee reported that it had received few responses from members in regard to the matter and it decided that it was not warranted in making any recommendation without better co-operation. The committee was instructed to prepare for publication the information it has obtained.

Bureau of Standards Work

A report of the Bureau of Standards by Mr. Karr, read by Secretary Corse, concluded the Thursday session. This report brought out the co-operative work that is being done by the Bureau of Standards in conjunction with a committee of the institute appointed to confer with the Bureau in reference to the preparation of alloys to be used in standardizing the form and dimension of standard test bars. Mr. Karr was appointed associate physicist of the Bureau of Standards, and was assigned to prepare these alloys, having started this work last March. It was decided that the work should be confined to testing one alloy at a time. The report went into considerable detail regarding tests decided on and the results that have been obtained from tests already completed.

New Officers

For the American Institute of Metals the following officers were chosen:

President, G. H. Clamer, Ajax Metal Company, Philadelphia.

Secretary-Treasurer, W. M. Corse, Lumen Bearing Metal Company, Buffalo, N. Y.

Vice-Presidents: For rolling mills—W. H. Bassett, American Brass Company, Waterbury, Conn.; for Michigan and Ohio, F. O. Clements, National Cash Register Company, Dayton, Ohio; for Ontario and Western Canada, C. H. Ivey, Empire Mfg. Company, London, Ont.; for Quebec, Robert Job, Milton Hersey & Co., Montreal, Que.; for Pennsylvania, Jesse L. Jones, Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.; for New England, Dr. E. Weintraub, General Electric Company, West Lynn, Mass.; for Chicago and Wisconsin, Fred Moerl, Pullman Company, Chicago; for Illinois, exclusive of Chicago, Phillip Mueller, Decatur, Ill.; for New York and New Jersey, C. A. Finnegan, Empire Smelting Company, Depew, N. Y.; for Virginia and South, E. S. Fretz, Light Foundry & Mfg. Company, Pottstown, Pa. H. W. Gillett was appointed chairman of the Programme Committee.

The Motor Truck Popularized in Motion Pictures.—Three locomotives were hauled by a LaFrance hydraulic truck on October 6 and 7 from a freight station on Staten Island, New York City, to the point of use. The locomotives, which were shipped by rail to Staten Island for the Beaver Engineering & Construction Company, weighed 18 tons each and were loaded on platform cars weighing 5 tons each. The route involved grades of 4, 9, 10½ and 12 per cent. In starting up the last hill one of the priming cups of the gasoline engine opened, and in trying to close it it was broken off. The truck pulled the load up the hill on three cylinders. The popular interest in such performances is indicated by the fact that one of the producers of motion pictures has included the event in its weekly series of interesting happenings the world over.

E. Arthur Tutein, Exchange Building, 53 State street, Boston, has been appointed exclusive agent in New England for the sale of pig iron made by the Thomas Iron Company, Easton, Pa.

Foundry Equipment and Machine Tool Exhibition

The exhibition, conducted by the Foundry & Machine Exhibition Company in the International Amphitheater, was very largely attended, there being more than 10,000 admissions. A large proportion of the visitors were there for strictly business and educational reasons and the exhibits fully recompensed those who came to see and learn. The display of purely foundry equipment and supplies was in itself an advance over any previous exhibition. To this was added a complete exposition of the latest improvements in machine tools, demonstrated under power in all of the standard types suitable for general shop work. The exhibition was in every way creditable. The handicap of a considerable distance intervening between the convention hall and the exhibition was again felt, accenting the division of interest that is unavoidable where the meetings and exhibition are in progress simultaneously.

Somewhat larger exhibits of machine tools have been seen in connection with the railroad master mechanics' conventions at Atlantic City, but that at Chicago was declared to be the most complete ever held, taking in a considerably broader line of equipment than was shown at Atlantic City. The exhibit was made all the more attractive by the display for the first time of a number of new machines and added features of more familiar ones. The line of wood-working machinery was quite complete.

Final figures show an attendance at the exhibition considerably larger than at any previous one, and manufacturers both of foundry equipment and machine tools were well pleased with the number of orders booked. In order to assure the amount of floor space now required, a movement is on foot to hold the conventions and exhibitions alternately in Chicago and in some Eastern city where an auditorium of sufficient size can be secured. At a meeting of a board of directors of the Foundry & Machine Exhibition Company held Thursday the executive committee was authorized to visit New York, Boston and Philadelphia to look up exhibition halls of sufficient size to house the exhibits and report back.

New Machines

In addition to the very complete exhibits of their well-known products made by machine tool builders, the following new machines were shown on the floor:

Acme Machine Tool Company, Cincinnati, Ohio. A 3¼ x 36-in. combination turret lathe.

Bullard Machine Tool Company, Bridgeport, Conn. Bullard vertical turret lathe with new water pan and safety guard attachment.

Hannifin Mfg. Company, Chicago, Ill. Three-jaw universal air-operated chuck, which can be applied to all kinds of machine tools.

Rockford Drilling Machine Company, Rockford, Ill. Four-spindle vertical chucking gang drilling machine.

Gardner Machine Company, Beloit, Wis. Roll sanding machine with four speeds of 2000 to 6000 r.p.m., for different sized spindles. The spindle tilts instead of the table.

Norton Company, Worcester, Mass. Two-inch floor stand and ¾-in. bench type of grinder on pedestal. These machines have long overhanging bearings, increasing the rigidity of the spindle bearings. The safety work rest bracket is removable instead of being cast in the machines. The spindle is increased to sufficient length so that safety taper flanges can be used with the maximum sized wheel. Another new feature is safety protection and dust boards, these being flexible to allow the use of wheels of any width. The belt guard comes 2 in. above the top of the wheels, allowing the drive from only the back of the machines, so that there is no danger of the operator coming in contact with the belt while working. Other new safety devices have been provided. The splash system of lubrication is provided to insure proper lubrication for several months.

Union Mfg. Company, New Britain, Conn. Combined punch, shear and rod-cutting machine.

Cincinnati Pulley Machinery Company, Cincinnati, Ohio. Bench drill and No. 3 drilling machine with power feed.

Barnes Drill Company, Rockford, Ill. A 22-in. all-geared self-oiling drilling machine.

William V. Robinson Company, Owosso, Mich. Automatic plate polishing machine and pipe polishing attachment.

British Unemployment Insurance

Consul General John L. Griffiths, London, furnishes an article on the above subject to the Daily Consular and Trade Reports from which the following extracts are taken:

The report for the first year of the operation of the unemployment insurance law, under which provision is made during periods of unemployment and illness for the great body of employees in the United Kingdom, shows that 2,508,939 unemployment books were issued; 559,021 claims for benefit were filed; 400,000 individual working men claimed benefits under the act; 774,494 payments were made; the total benefits paid aggregated $1,150,722; the lowest payment for any one week was $23,359 and the highest $93,436; the year's gross income amounted to $11,039,168; at the close of the year there was an invested balance of $7,835,065; the maximum of unemployed falling within the provisions of the act was 118,000, and the minimum, 67,000.

Of the total annual income derived under the insurance act, the employers and workmen contributed about three-quarters and the State one-quarter. In a large proportion of cases the unemployment was very short, 30 per cent. falling within the waiting week during which no claim could be made, 62 per cent. received benefits, while 7 per cent. was excluded for various reasons, and 1 per cent. represented unemployment which continued after the period during which benefits are paid.

It is stated that the report is only preliminary in certain respects, as some of the figures have not been fully and definitely analyzed. It is to be noted also that while the insurance law has been in operation for a year, there has been only six months' experience of the payment of unemployment benefits.

The Cleaning of Steel and Iron

C. S. Thompson, foreman plater, General Fireproofing Company, Youngstown, Ohio, gives in the Metal Industry a method for cleaning iron and steel which have been treated with heavy mineral oils in the various processes of machining. It does not apply to surfaces into which oil has been burned, as in case-hardening. An electrotype is employed, of either commercial caustic potash or soda, about 1 lb. of the caustic to each gallon of water, to which is added 2 oz. of cyanide of potassium. The current, which must be from 6 to 10 volts and about 40 amperes to each square foot to be cleaned, or about 240 watts to each square foot of surface of work, must be used direct the same as for plating. There must be a double throw switch in the circuit, and after the work has been allowed to run for some five or ten minutes it will become coated with a film of bluish white metal, which is potassium or sodium as the case may be, and which becomes black on exposure to the atmosphere. When the potassium or sodium is noticeable to any great extent, the current must be reversed and in a very few minutes the work is clean and bright. Rinsing in hot water follows, then in cold, and dipping in a weak solution of hydrochloric acid and water.

According to recently published figures over $9,000,000 in wages was paid out to workmen in the Mahoning Valley, Ohio, in the third quarter of this year. This amount exceeds the sum paid out in the third quarter of 1912 by over $2,000,000, and the same period in 1911 by over $2,500,000. In the month of August $3,300,000 was paid, out of which about $300,000 was the profit-sharing bonus distributed to employees by the Youngstown Sheet & Tube Company.

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Editors

Geo. W. Cope A. I. Findley W. W. Macon

Charles S. Baur - - *Advertising Manager*

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New York Harbor Blast Furnaces

There is certainly no relation of cause and effect between the sweeping reductions in iron and steel duties and the somewhat more definite shape taken by the project for blast furnaces in New York harbor. The Atlantic seaboard is particularly exposed territory now that pig iron and steel billets are on the free list. Moreover, free iron ore is much less of an inducement to the building of a seaboard iron and steel plant than it would have been had the preceding tariff carried the 40-cent duty of the old days. That the proposal to build blast furnaces in the metropolitan district should have come to the point of taking options on land is perhaps only a natural outcome of the years of theoretical promotion. It is now a matter of putting the scheme to the acid test of a stock subscription.

Unquestionably the iron ore developments of the past few years have favored the promoters of the New York harbor iron plant. The reserves of Newfoundland and Cuba have been shown to be almost limitless. Swedish ores, and more recently those of Venezuela and Texas, have also become available at prices with which Lake Superior ores are not competitive at Eastern blast furnaces. At no other location in the country can iron ore be delivered on a commercial basis from so many sources. Another factor in the shaping up of the project now discussed is the approaching completion of the Erie barge canal and of the deeper Champlain canal connecting Lake Champlain and the Hudson River, making the freight rate on Lake Champlain ores about one-third what it is to-day. Those in interest count also on the possibility of bringing Lake Superior ores to New York Bay at a low freight when the barge canal is completed from Buffalo two or three years hence. It is a question, however, if even at a 50-cent rate on ore by water from Buffalo the high-grade ores of Lake Superior could figure to any extent in the mixture of a New York harbor furnace seeking to compete for Eastern pig-iron trade against Buffalo furnaces. Pig iron could doubtless be sent from Buffalo by the barge canal at well nigh as low a rate as ore, and two tons of ore would be tallied for every ton of pig iron.

On the fuel side the New York harbor plant would find by-product coke ovens some offset to the long haul from the coking coal districts of western Pennsylvania and West Virginia. Assuming that coal could be delivered at the ovens at $3 a ton, that may be taken as the cost of coke, after the returns from by-products are deducted. With the large population of near-by towns there would be no difficulty in realizing upon coke-oven gas for illumination or upon electric current generated by blast-furnace-gas-driven engines.

Labor cost in blast-furnace operation has been a diminishing item as mechanical appliances have replaced hand labor. The drawback of union control that is marked in so many trades in the metropolitan district, particularly the building trades, would therefore not be serious in the production of pig iron; but when it came to the manufacture of finished products, which would be the ultimate development of such an enterprise, there would come also the problems of an organization of skilled workmen under New York conditions.

Confined to the production of pig iron, a New York harbor plant would find a market in the New Jersey district nearest at hand, in which is a considerable consumption of foundry iron, also in Brooklyn, at

Hudson River points and to an extent in New England. It would have an advantage in cost and in freights to the above markets over a number of eastern Pennsylvania furnaces; but Buffalo assembling costs would be less and Buffalo furnaces, with the barge canal, would have cheap transportation to Hudson River and Long Island Sound points and would thus continue to be an important factor in the New England market. Something may be heard there also, in time, of Boston harbor competition, considerable interest having been developed in a project for a blast furnace there based on Newfoundland and other foreign ores and by-product coke.

The export possibilities of the New York harbor site will lie in the manufacture of finished products. As a bulk product one step beyond pig iron, cast-iron pipe has been proposed. In finished steel the investment required for the production of any variety of products would be very large, and in the domestic field Eastern competition with Pittsburgh in the heavier lines is already robust. While the two Eastern seaboard steel plants in existence do not hold out large promise of profits for the building of others, there were untoward conditions in the case of one of these that would not apply to a new undertaking involving blast furnaces. But on the whole the probabilities are that any New York harbor enterprise that will materialize in the near future will be confined to pig iron, and if further manufacture is attempted it will be in one or two lines for which plant outlay would not be excessive and for which near-by districts could furnish the principal market.

Tin Plate Import Possibilities

Some comparisons have lately been published as to selling prices of Welsh tin plate and the cost of manufacture in the United States which are not in accord with conditions as generally understood. One of the statements thus made is that Welsh mills have sold tin plate at $2.60 a box and have made "a very handsome profit" when doing so. There has been no such Welsh price for a long time, and to recover cost at such a price, with no profit, the Welsh mills would have to get their steel and pig tin at much lower prices than now ruling.

The prices at which Welsh mills are willing to sell have been disclosed from time to time by their competition for "rebate plate" in the American market, i. e., tin plate which is used for export purposes, and if bought abroad is entitled to drawback of 99 per cent. of the duty originally levied. Such experiences have indicated that the publicly quoted prices abroad are fairly representative of the market. The present open price, as shown by the cable report to *The Iron Age* last week, is 12s. 10½d., f.o.b. Wales, equivalent to $3.13, or about $2.98 for 100-lb. plates, the standard on this side. The water rate varies, and 10 cents a box, as given in one statement, is a low estimate. The 15 per cent. duty, on $2.98, would be 45 cents, making the cost, delivered New York, duty paid, $3.53. While the Welsh quotation is subject to a cash discount, there are commissions and insurance to be considered, so that it seems quite improbable that Welsh tin plate could be delivered in New York at much if any below $3.50 per box for 100-lb. cokes. Considering the state of the Welsh market it is quite improbable that there is much profit at this figure, whereas the statement has been published that Welsh mills would make "a very handsome profit" if they sold at a price equivalent to $3.09 in New York.

The freight from Pittsburgh to New York is 16 cents per 100 lb., which is taken as equal to 18 cents per base box, 100 lb., including tare, so that $3.53, New York, is equivalent to $3.35, Pittsburgh.

It may be mentioned that while the American price for tin plate in the season just ended has been $3.60, large lots have gone at concessions, for quantity, as usual, in some cases nearer $3.35 than $3.60; and two facts remain—first, that American buyers would give American mills the preference, to the extent of 10 or 15 cents a box, on account of the various conveniences involved in dealing at home, and second, that on account of lower prices for steel and perhaps lower prices for tin, the cost of manufacture to American mills now promises to be somewhat less than in the season just closed.

Under the present alignment, therefore, fears seem to be groundless that there will be any large tin plate importations on the Atlantic seaboard or that American mills will be prevented from making a profit by naming prices to keep out the foreign material. As to the Pacific coast, it is recognized that conditions are different, the large freight handicap of the American mills putting them at a great disadvantage.

Compensation of Dependent Children

The decisions of courts of final appeal bearing upon workmen's compensation have now begun to accumulate in this country. These have established important precedents and afforded the basis for amendments of the various existing acts and for more intelligent study in the preparation of statutes yet to be enacted. One of the latest decisions, coming from the Massachusetts Supreme Court, relates to the benefits bestowed upon the dependent children of men and women who meet death by accident in the course of their employment. The laws of practically all States where compensation has been adopted provide that in the case of accidental death of husband or wife (each of whom is held to be the dependent of the other) the survivor and each dependent child shall receive a certain sum per month for several years, the amount being based upon previous average earnings of the deceased. The Massachusetts court decides that under the wording of the act the surviving parent shall receive not only his or her personal benefit, but those of the children as well. Incidentally, the same court is now considering the question of the disposition to be made where a stepchild of the surviving parent is the beneficiary. The above decision is probably applicable to other compensation acts, the wording of this provision differing but little.

Those who are closely in touch with working men and women express doubt as to the wisdom of this provision of the law under its final interpretation by the Supreme Court. They believe that with a constantly increasing class of those employed in industrial establishments the guardianship thus created would be irresponsible, and that money given for the support of surviving children might never serve the purpose intended by the law. Of course, the surviving parent is the natural guardian and, as the law has been understood previously, the money would ordinarily pass through his or her hands, but not necessarily so. As it is, the employer or the insurance company has no

option. The wife of an idle, dissolute man supports the family with wages earned in a mill. She is killed. The husband collects his children's weekly indemnity as well as his own, and squanders it. There are cases also where a surviving mother should not be entrusted with money intended for the benefit of the children.

The suggestion is made that the State evolve some system of guardianship. The commission which determines the award in each case of accident might be empowered to pass upon the fitness of the surviving parent, with the alternative of a legal guardian appointed by a court. The decision has called attention to a phase of compensation which has attracted little notice.

Designating Piping by Colors

The suggestion was made several years ago at a meeting of the American Society of Mechanical Engineers that a material advantage results from designating by a color scheme the various classes of piping in a manufacturing plant. In a few cases the idea has been adopted, but the practice is not generally known. It is thoroughly practicable in its application, except perhaps in old buildings, where piping has been hidden in walls and floors.

To be able to trace quickly and surely any line of pipe—sprinkler system, electric conduit, water, steam, gas, sewage—may be essentially important in an emergency, and may frequently secure an economy of labor in making repairs and changes. The cost is trifling, if any painting at all is to be done. To protect piping by a coat of paint preserves its life, and the increased neatness or attractiveness given to the works is a wholesome factor.

Various combinations of color are used, all beginning, however, with the brilliant red of the fire protection system. In one large factory the water pipes are blue, the electric conduits white, and the steam, gas and sewage pipes either black or in the natural color of their material. It is easy to elaborate the scheme. The task of tracing a pipe in the open areas of a plant is usually simple enough, but there are spaces, such as floor conduits, where the complication of lines requires time to analyze, unless each has its labeling color.

Another Ore Rate Investigation

The Interstate Commerce Commission decided October 15 on a comprehensive investigation into the reasonableness of the freight rate on iron ore in carloads from Lake Erie ports to points in Ohio and West Virginia and points in Pennsylvania west of and including Johnstown, including the grouping of points of destination and the relationship of the rates to the several groups. The action of the commission is caused by the unsatisfactory working out of its order in the numerous iron-ore cases in territory covered within the past few years.

Some facts and figures regarding the lock work at the Panama Canal were given in a recent issue of the Canal Record. Respecting the fabrication and erection of the lock gates, it is stated that the local force of the McClintic-Marshall Construction Company was 134 men in May, 1911, at the beginning of erection, and attained a maximum of about 5300 men in the months of March, April and May, 1913. The force on September 22, 1913, was 1940 men.

The city of Cincinnati will soon call for bids for the construction of a 3000-ft. viaduct in Hyde Park. A large tonnage of reinforcing concrete bars will be required.

August Iron and Steel Exports and Imports

The August report of the Bureau of Foreign and Domestic Commerce shows the iron and steel exports for August to have made a decline, as compared with previous months. The total value of the exports of iron and steel and manufactures thereof, not including iron ore, in August was $23,947,440, against $24,170,604 in July and $25,228,346 in June.

The exports of commodities for which quantities are given totaled 209,855 tons in August, against 237,157 gross tons in July and 243,188 tons in June. Noteworthy changes in the exports were pipes and pipe fittings, 20,071 tons in August, against 25,048 tons in the previous month, and steel sheets, 7246 tons in August and 10,796 tons in July.

Import values for August, $2,415,212, were considerably below those of July, which were $3,080,683, and of June, which were $3,291,875.

Details of the exports of tonnage commodities for August and for eight months ended with August, compared with the corresponding periods of the previous fiscal year, are as follows:

Exports of Iron and Steel

	August		Eight Months	
Commodities	1913 Gross tons	1912 Gross tons	1913 Gross tons	1912 Gross tons
Pig iron	19,996	23,994	185,020	172,697
Scrap	5,351	10,771	64,425	72,962
Bar iron	1,646	2,261	11,576	13,264
Wire rods	1,280	4,899	48,523	42,123
Steel bars	14,925	22,547	150,354	128,363
Billets, ingots and blooms, n.e.s.	4,208	34,699	81,904	199,947
†Bolts and nuts	1,808	2,226	15,296	*3,776
Hoops and bands	1,231	1,236	12,274	6,886
†Horse shoes	81	67	852	*189
Cut nails	308	656	2,493	7,432
†Railroad spikes	696	1,605	8,357	*2,185
Wire nails	4,196	7,466	32,244	51,735
All other nails, including tacks	324	331	2,793	6,938
Pipe and pipe fittings	20,071	18,334	210,661	172,270
Radiators and cast-iron house boilers	417	803	5,470	3,066
Steel rails	43,818	41,147	332,276	312,894
†Galvanized-iron sheets and plates	9,565	14,125	62,321	*28,389
All other iron sheets and plates	2,191	3,352	19,023	115,751
Steel sheets and plates	....	....	....	§150,721
†Steel plates	20,122	24,153	214,655	*49,430
†Steel sheets	7,246	10,857	84,486	*17,563
Structural iron and steel	33,154	27,639	281,668	192,324
Tin and terne plates	3,864	5,935	44,383	60,100
Barbed wire	7,099	8,631	51,710	62,951
All other wire	6,258	14,911	76,905	104,479
Totals	209,855	282,645	1,999,669	1,978,435

*Figures cover period since July 1, 1912.
†Not separately stated prior to July 1, 1912.
§Figures are for January to June, inclusive.

In August the imports of commodities for which quantities are given totaled 18,740 tons, against 39,694 tons in July and 36,597 tons for June. August pig-iron imports were 11,069 tons as compared with 16,404 tons for July and scrap-iron imports declined from 9218 tons in July to 1686 tons in August. Tin and terne plate imports for August were 186 tons, as against 3648 tons in July and 7726 tons in June. Billets, bars and steel plates were imported to the amount of 1561 tons in August, as compared with 2482 tons in July.

Details of the imports of commodities for which quantities are given for August and the eight months ended with August, compared with the corresponding periods of the previous fiscal year, are as follows:

Imports of Iron and Steel

	August		Eight Months	
Commodities	1913 Gross tons	1912 Gross tons	1913 Gross tons	1912 Gross tons
Pig iron	11,069	13,067	109,193	77,671
Scrap	1,686	1,778	36,574	11,373
Bar iron	1,818	1,416	20,961	16,793
Structural iron and steel	1,104	188	9,016	1,584
Billets, bars and steel plates, n.e.s.	1,561	1,332	15,491	12,100
Steel rails	52	716	3,562	2,495
Sheets and plates	152	592	2,290	2,439
Tin and terne plates	186	244	15,422	1,296
Wire rods	1,112	1,254	11,706	9,635
Totals	18,740	20,587	224,215	135,386

The imports of iron ore in August were 213,139 gross tons, against 272,017 tons in July, 241,069 tons in June and 178,828 tons in August, 1912.

The total value of the exports of iron and steel and

manufactures thereof, not including iron ore, for the eight months ended with August was $203,650,894, against $190,413,532 for the corresponding period of last year. The total value of the imports of iron and steel and manufactures thereof, exclusive of iron ore, for the eight months ended with August, 1913, was $23,287,336, as compared with $18,509,065 for the corresponding period of 1912.

Iron Making in New York Harbor

Witherbee, Sherman & Co. Interested in a New Project—Land Already Under Option

At least one of the projects for the building of a blast furnace plant and steel works on a New York harbor site has assumed more definite shape by the recent taking of options on a considerable tract of land north of Perth Amboy, N. J. While the present proposal is for two blast furnaces of modern capacity and construction and the operation of a by-product coke plant, the ultimate development of this, as of the other similar projects promoted by various interests in the past year or two, is the erection of a steel plant. Witherbee, Sherman & Co. and associates have taken the options referred to above, covering 175 acres of what has been thus far waste land, like much more of the low-lying tracts on the eastern border of New Jersey. Their plans are not definite. Nothing will be done until more is known of iron and steel conditions in eastern markets under the new tariff, and of the outcome of some other phases of the business situation. No company has been formed and the steps thus far taken are simply preliminary and with a view to focusing the investigations of those concerned, which have been in progress for a good many months. Already expectations of property holders on the New Jersey shores of New York harbor have been raised by this and other iron and steel projects involving water frontage. The location selected is at Boynton Beach, N. J., which is between Perth Amboy and the town of Sewaren. It is on the Arthur Kill, which washes Staten Island on its entire western shore, connecting Raritan Bay on the south with Newark Bay on the north. Boynton Beach is opposite the southern portion of Staten Island and is 20 miles from the Battery, New York City. The channel is 29 ft. deep off Boynton Beach and seagoing vessels come up to nearby docks. Woodbridge River empties into Arthur Kill on the south side of the site and the 175 acres under option have a frontage of 600 ft. on the river, in addition to about one-third mile on the kill.

Witherbee, Sherman & Co.'s interest is naturally that of providing an outlet for a portion of the production of their Port Henry ores of which for a number of years nearly 1,000,000 tons a year have been marketed, chiefly in eastern Pennsylvania. If the present project is carried through it is not yet determined whether the Witherbee, Sherman & Co. ore properties at Mineville, near Port Henry, N. Y., and the ores they have acquired in other Lake Champlain districts, some of them exceptionally low in phosphorus, will become part of the holdings of the proposed company or whether the new enterprise shall be based in part on a long time contract for these ores.

A New York harbor site has the advantage of ability to unload into furnace yard ores from various foreign sources. Newfoundland, Cuban, Swedish, Venezuelan and Mediterranean ores are available, and shipments could be made advantageously from the brown ore deposits of Texas. From Port Henry an all waterhaul of 275 miles to the Boynton Beach site would be from Lake Champlain to Troy, N. Y., by the deepened Champlain Canal and then down the Hudson River. Government lock work at Troy will delay the completion of this water route until late 1915 or early 1916. The new Champlain Canal will permit of cargoes of 1500 tons or more as against 150 tons at present. Based on the new navigation facilities offers have been received of ore charters from Port Henry to the new site at 50 cents a ton. The new Erie barge canal which is likely to be completed in the next two or three years, will make possible a similar rate or a lower one, in case it is desired to bring Lake Superior ores from Buffalo docks to New York harbor.

Calculations as to coal supply for by-product coke ovens are not definite, but is believed western Pennsylvania or West Virginia coal can be delivered at Boynton Beach at $3 a ton, and, allowing for by-products, that would practically represent the cost of coke at the blast furnace. The disposal of coke oven gas for illumination would not be difficult in view of the large population in closely contiguous districts. Limestone would be drawn from not far distant points in New Jersey and on the Hudson River.

While the metropolitan district contains no large consumers of pig iron the aggregate of foundry iron melted in New Jersey centers within easy reach of the new site, added to the Brooklyn consumption, is considerable, and shipments to Long Island Sound points for New England consumption could be made at a low freight. Some consideration has been given to the proposal to manufacture cast iron pipe, though this industry is already well represented in eastern territory. Something could be done and advantageously in the export pipe trade. Naturally an open-hearth steel plant is considered a probability, but there is no definite proposal as to the line of finished material to be manufactured, though tin plate has been mentioned.

Standard Steel Company's Reorganization

The outline of the reorganization plan of the Standard Steel Company, formerly the Southern Iron & Steel Company, published in *The Iron Age* of August 14, is not materially altered in the amplified plan which has been printed in pamphlet form. The proposed $15,500,000 capital stock of the new company is to be divided into $3,000,000 first preferred 7 per cent. stock, cumulative after November 1, 1913, preferred as to assets as well as dividends, and redeemable at $110 per share; $5,000,000 second preferred non-cumulative 6 per cent stock, convertible into common stock at par, and preferred as to assets over the common stock, and $7,500,000 common stock. During the present reorganization the Shannon-McDonough ore properties have been acquired under option and also the Nixon red ore property, provision for which has been made in the plan.

The proposed application of $1,981,887.50 of new funds to be raised is shown in the table below.

Principal amount of loan of Standard Company	$415,402.10
Payment of principal of notes given in connection with ore purchases	160,650.00
Payment of amount required for creditors' dividends of the Steel Company and expenses of liquidation and reorganization (estimated)	250,000.00
For working capital and other corporate purposes of the new company	173,947.90
For cost of contemplated additions, betterments, improvements and other corporate purposes of the new company	981,887.50
Total	$1,981,887.50

All the capital stock of the Standard Company, except directors' qualifying shares, is held as security for a loan of $415,402.10, which is past due. The Standard Company gave its notes for $50,000 and $110,650 in order to acquire the Shannon-MacDonough properties, which notes mature November 5 and November 17, respectively. A syndicate has been formed to underwrite the first $1,000,000 called for under the reorganization from the holders of certificates of deposit and the certificates representing the stocks of the Southern Iron & Steel Company.

The holders of certificates representing indebtedness and certificates representing stock ownership are called upon to furnish the $1,981,887.50 required. Trust certificates representing $580,000 par value of the first preferred stock and $4,555,000 of the common stock will be turned over to the old stockholders upon payment of $580,000.

It is provided that all the first and second preferred stock of the new company other than directors' qualifying shares be vested for not over five years in Alexander J. Hemphill, Alfred A. Cook and Francis D. Pollak as trustees.

The American Shipbuilding Company last week closed a contract with Pittsburgh interests for a bulk freight boat for 1914 delivery. The boat will be 524 ft. in length, 54 ft. beam and 30 ft. deep, being a duplicate of the Quincy A. Shaw of the Hanna fleet. The shipbuilding company has also recently received orders for considerable repair work.

The Iron and Metal Markets

More Car Inquiries

Rail Orders Still Withheld

Little Heard of Foreign Steel—Further Declines in Pittsburgh Prices

While the slowing down in steel works operations is not marked, each week makes some addition to idle forces. The Alabama steel plant has just laid off several hundred men, as rail orders on which it chiefly depends are slow in coming to the mills. The readjustment of prices of steel products goes on, and several reductions are made this week in our Pittsburgh quotations.

Sentiment in the industry is not so hopeful, as the probability of any considerable buying movement at present price levels grows less. At the same time full weight is given, in pointing out favorable factors, to the continued insistence of consumers on the prompt shipment of their orders.

Car inquiries and car buying have been the encouraging developments of the week and the most is made of the Commerce Commission's permission for some advance in rates between Missouri River points, in its bearing on the pending case of the railroads east of the Mississippi. The Atlantic Coast Line has placed 1300 cars and a number of Western roads have made inquiries, these including 2500 for the Wabash and several thousand for the Missouri Pacific. The Buffalo, Rochester & Pittsburgh inquiry has been increased to 3000.

The Great Northern rail contracts are thus far 40,000 tons, of which 25,000 tons went to Chicago district mills. Some addition will probably be made to the 15,000 tons distributed among Eastern mills. The Pennsylvania and New York Central orders are not coming out as expected and are likely to be delayed for some time.

The trade is watching sharply for import developments, but little foreign steel has come this way. Our cable tells of some sales of Belgian steel bars for the United States. It is reported that San Francisco dealers bought several thousand tons of European bars at 1.50c. at wharf, whereas Pittsburgh mills have lately quoted 1.75c. at San Francisco. At Boston a quotation of 1.23c. for steel bars, duty paid, is reported from a European mill. A sale of 1000 tons of German 2-in. billets for delivery at the Virginia seaboard is reported and denied. Pennsylvania mills have anticipated competition from German small billets of section corresponding to sizes rolled here on bar mills and sold at bar prices.

The plate market has declined slowly. While 1.35c. is the more common Pittsburgh quotation, as low as 1.30c. has been done. Foreign plates have been quoted at 1.65c. on the Pacific Coast.

Structural lines show the effects of dear money and the wait for lower steel prices. The market has settled to 1.35c. Pittsburgh, while business done in New England and other Eastern points has figured back to somewhat less at Pittsburgh mill.

The Standard Oil Company has bought 30 miles of 8-in. pipe for shipment to Mexico and a natural gas company in Ohio has placed a considerable tonnage of 3 to 10-in. pipe. The readjustment of merchant pipe prices on November 15 is expected to be chiefly downward.

Chicago territory shows further irregularity in bar prices and the weakness is pronounced in bar iron, the iron mills in that district being operated at only 50 to 75 per cent. capacity. Some bar iron sales were made by Chicago mills at 1.35c., Cleveland, or 1.20c. at mill.

Recent pig iron buying in the Central West developed some weakness, No. 2 foundry iron having sold at $13.75 at Valley furnace, a decline of 25 cents. Steel making irons at Pittsburgh and in Eastern Pennsylvania are also about 25 cents lower. There is a halt in pig iron buying, even more pronounced than that in finished steel.

British markets are under increasing pressure from German and other Continental mills, as business with the latter has fallen off of late. Prices are falling there, with no prospect of an early turn for the better. Considerable Canadian inquiry for tin plate is reported in Wales.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

	Oct. 22, 1913.	Oct. 15, 1913.	Sept. 17, 1913.	Oct. 23, 1912.
Pig Iron, Per Gross Ton:				
Foundry No. 2 X, Philadelphia.	$16.00	$16.00	$15.85	$18.00
Foundry No. 2, Valley furnace.	*13.75*	13.85	14.00	16.25
Foundry No. 2 S'th'n, Cin'ti...	14.50	14.50	14.25	16.75
Foundry No. 2, Birmingham, Ala.	11.25	11.25	11.00	13.50
Foundry No. 2, furnace, Chicago*	15.00	15.00	15.00	17.00
Basic, delivered, eastern Pa....	15.25	15.25	15.25	18.15
Basic, Valley furnace.....	*13.75*	14.00	14.00	16.15
Bessemer, Pittsburgh	16.65	16.65	16.65	17.90
Malleable Bessemer, Chicago*..	15.50	15.00	15.00	17.00
Gray forge, Pittsburgh.....	*14.30*	14.40	14.25	16.40
Lake Superior charcoal, Chicago	15.25	15.25	14.75	18.75
Billets, etc., Per Gross Ton:				
Bessemer billets, Pittsburgh....	*23.00*	23.50	25.00	27.00
Open-hearth billets, Pittsburgh..	*23.00*	23.50	24.00	27.50
Open-hearth sheet bars, P'gh....	*23.50*	24.00	25.00	28.00
Forging billets, Pittsburgh.....	*27.00*	29.00	30.00	34.00
Open-hearth billets, Philadelphia	*24.00*	25.00	25.00	30.00
Wire rods, Pittsburgh.....	26.50	26.50	27.00	28.50
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	14.00	14.00	14.00	18.00
Iron rails, Philadelphia.....	17.50	17.50	17.50	18.00
Carwheels, Chicago	12.00	12.00	12.75	16.50
Carwheels, Philadelphia	*12.00*	12.25	13.00	15.00
Heavy steel scrap, Pittsburgh..	*11.75*	12.00	12.25	16.25
Heavy steel scrap, Philadelphia	11.00	11.00	11.75	15.50
Heavy steel scrap, Chicago.....	10.00	10.00	10.75	14.25
No. 1 foundry cast, Pittsburgh..	*12.50*	12.75	12.75	15.00
No. 1 foundry cast, Philadelphia	13.50	13.50	12.75	14.75
No. 1 f'dry cast, Ch'go (net ton)	*10.25*	10.50	10.50	14.25
Finished Iron and Steel, Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bessemer rails, heavy, at mill...	1.25	1.25	1.25	1.25
Iron bars, Philadelphia.....	1.32½	1.32½	1.35	1.60
Iron bars, Pittsburgh	1.55	1.55	1.55	1.50
Iron bars, Chicago	1.25	1.25	1.35	1.50
Steel bars, Pittsburgh	1.40	1.40	1.40	1.40
Steel bars, New York.....	1.56	1.56	1.56	1.56
Tank plates, Pittsburgh	1.35	1.35	1.40	1.45
Tank plates, New York.....	1.51	1.51	1.56	1.61
Beams, channels and angles, P'gh	*1.35*	1.40	1.40	1.45
Beams, channels, angles N. Y..	1.51	1.51	1.56	1.61
Skelp, grooved steel, Pittsburgh..	1.35	1.35	1.35	1.40
Skelp, sheared steel, Pittsburgh	1.45	1.45	1.45	1.45
Steel hoops, Pittsburgh	1.60	1.60	1.60	1.45
Sheets, Nails and Wire, Per Pound to Large Buyers:				
Sheets, black, No. 28, Pittsburgh	2.05	2.05	2.15	2.25
Galvanized sheets, No. 28, P'gh.	3.10	3.10	3.15	3.40
Wire nails, Pittsburgh.....	*1.60*	1.65	1.65	1.70
Cut nails, f.o.b. Eastern mills..	*1.65*	1.70	1.70	1.65
Cut nails, Pittsburgh	1.55	1.55	1.60	1.70
Fence wire, ann'l'd, 0 to 9, P'gh	*1.40*	1.45	1.45	1.50
Barb wire, galv., Pittsburgh....	*2.00*	2.05	2.05	2.10

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Coke, Connellsville,

Per Net Ton at Oven;	Oct. 22, 1913.	Oct. 15, 1913.	Sept. 17, 1913.	Oct. 23, 1912.
Furnace coke, prompt shipment.	$2.00	$2.10	$2.25	$3.75
Furnace coke, future delivery..	2.10	2.25	2.25	2.75
Foundry coke, prompt shipment.	2.75	2.75	2.90	4.00
Foundry coke, future delivery..	3.00	3.00	3.00	3.50

Metals,

Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.....	17.00	16.62½	16.87½	17.75
Electrolytic copper, New York..	16.75	16.37½	16.75	17.62½
Spelter, St. Louis	5.20	5.20	5.65	7.40
Spelter, New York.....	5.35	5.35	5.80	7.55
Lead, St. Louis	4.20	4.30	4.62½	4.90
Lead, New York	4.35	4.45	4.75	5.05
Tin, New York	40.35	40.35	42.60	50.40
Antimony, Hallett's, New York	7.12½	7.12½	7.75	9.75
Tin plate, 100 lb. box, Pittsburgh	3.50	3.50	3.50	3.60

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier, 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.35c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.....	.10
Gauges under 3-16 in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10.....	.30
Gauges under No. 10 to and including No. 12.....	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles 3 ft. in diameter and over.....	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths, under 3 ft., to 2 ft., inclusive.....	.25
Cutting to lengths, under 2 ft., to 1 ft., inclusive.....	.50
Cutting to lengths, under 1 ft.....	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.35c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.....	.10
H-beams over 18 in.....	.10
Angles over 6 in. on one or both legs.....	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909.....	.70
Tees, structural sizes (except elevator, hand rail, car-truck, and conductor rail).....	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909..... .20 to	.80
Deck beams and bulb angles	.30
Hand rail tees	.75
Cutting to lengths, under 3 ft., to 2 ft. inclusive....	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.....	.50
Cutting to lengths, under 1 ft.....	1.55

No charge for cutting to lengths 3 ft. and over.

Wire Rods and Wire.—Bessemer, open-hearth and chain rods, $26.50. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.40 to $1.45; galvanized, $1.80 to $1.85. Galvanized barb wire, to jobbers, $2 to $2.05; painted, $1.60 to $1.65. Wire nails, to jobbers, $1.60 to $1.65.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.60	$1.65	$1.70	$1.75	$1.85	$1.95	$2.05	$2.15
Galvanized	2.05	2.05	2.10	2.15	2.25	2.35	2.75	2.85

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe (full weight), in effect from August 8, 1913, and iron pipe (full weight), from June 2, 1913:

Butt Weld.

Steel. Inches.	Black.	Galv.	Iron. Inches.	Black.	Galv.
⅛, ¼ and ⅜	73	52½	⅛ and ¼	66	47
½	77	66½	⅜	65	46
¾ to 3	80	71½	½	69	56
			¾ to 2½	72	61

Lap Weld.

2	76	67½	1¼	56	45
2½ to 6	78	69½	1½	67	56
7 to 12	75	64½	2	68	58
13 to 15	52	..	2½ to 4	70	61
			4½ to 6	70	61
			7 to 12	68	55

Reamed and Drifted.

1 to 3, butt	78	69½	1 to 1½, butt	70	59
2, lap	74	65½	2, butt	70	59
2½ to 6, lap	76	67½	1¼, lap	54	43
			1½, lap	65	54
			2, lap	66	56
			2½ to 4, lap	68	59

Butt Weld, extra strong, plain ends.

⅛, ¼ and ⅜	68	57½	⅜	63	52
½	73	66½	½	67	60
¾ to 1½	77	70½	¾ to 1½	71	62
2 to 3	75	71½	2 and 2½	72	63

Lap Weld, extra strong, plain ends.

2	73	64½	1½	65	59
2½ to 4	75	66½	2	66	58
4½ to 6	74	65½	2½ to 4	70	61
7 to 8	67	56½	4½ to 6	69	60
9 to 12	62	51½	7 and 8	63	53
			9 to 12	58	47

Butt Weld, double extra strong, plain ends.

½	63	56½	½	57	48
¾ to 1½	66	59½	¾ to 1½	60	52
2 to 2½	68	61½	2 and 2½	62	54

Lap Weld, double extra strong, plain ends.

2	63	56½	2	55	49
2½ to 4	65	58½	2½ to 4	60	54
4½ to 6	64	57½	4½ to 6	59	53
7 to 8	57	46½	7 to 8	52	42

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads on lap-welded steel, in effect from May 29, 1913, and standard charcoal-iron boiler tubes, in effect from January 1, 1913, are as follows:

Lap-Welded Steel.		*Standard Charcoal Iron.*	
1¼ and 2 in.	60	1½ in.	44
2¼ in.	57	1¾ and 2 in.	48
2½ and 2¾ in.	63	2¼ in.	44
3 and 3½ in.	67	2½ to 2¾ in.	53
3½ to 4½ in.	69	3 and 3½ in.	53
5 and 6 in.	63	3½ to 4½ in.	58
7 to 13 in.	60		

Locomotive and steamship special grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.
2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.

	Cents per lb.
Nos. 3 to 8	1.45 to 1.50
Nos. 9 and 10	1.50 to 1.55
Nos. 11 and 12	1.55 to 1.65
Nos. 13 and 14	1.60 to 1.70
Nos. 15 and 16	1.70 to 1.75

Box Annealed Sheets, Cold Rolled.

Nos. 10 and 11	1.70 to 1.80
No. 12	1.70 to 1.80
Nos. 13 and 14	1.75 to 1.85
Nos. 15 and 16	1.80 to 1.90
Nos. 17 to 21	1.85 to 1.95
Nos. 22 and 24	1.90 to 2.00
Nos. 25 and 26	1.95 to 2.05
No. 27	2.00 to 2.10
No. 28	2.05 to 2.15
No. 29	2.10 to 2.20
No. 30	2.20 to 2.30

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11	2.10
No. 12	2.20
Nos. 13 and 14	2.20
Nos. 15 and 16	2.35
Nos. 17 to 21	2.50
Nos. 22 and 24	2.65
Nos. 25 and 26	2.80
No. 27	2.95
No. 28	3.10
No. 29	3.25
No. 30	3.40

Pittsburgh

PITTSBURGH, PA., October 22, 1913.

The only favorable feature of an otherwise very unsatisfactory condition is that when a new order is placed the buyer insists on getting his material at once. This indicates that stocks are down to a minimum, and that everybody is buying only such material as is absolutely needed. The result is that more orders are being placed than in September, but tonnages involved are smaller. There has been a slowing down to some extent in mill operations, some of the larger steel companies having cut out the Saturday night and Sunday night turns and are closing down Saturday noon, and staying idle until Monday morning. This results in a lessening in output and a decrease in the earnings of the men, but at the same time has the effect of holding the mill organizations together. There were no serious breaks in prices in the past week, but the readjustment to a lower basis of values is still going on, and, while declines in prices are gradual, yet they are insistent. Basic pig iron, which held nominally at $14, has gone to $13.75 or lower, while Bessemer, which is nominally $15.75, could be had at $15.50 or less if any new business were coming out. Bessemer and open-hearth billets have settled down to about $22.50 and sheet bars to $23 or $23.50, makers' mills. Small lots have sold below these prices. No. 28 Bessemer black sheets have touched 2c. in some cases, but most mills are holding for 2.05c. The larger mills are holding plates and shapes at 1.35c., but some of the smaller plate mills have done 1.30c. There is no new business in tin plate, the nominal price being $3.50 per base box. Standard makes of furnace coke are fast settling down to about a $2 basis. The scrap trade is utterly neglected and prices have gone off still more. Scrap is now selling at the lowest prices in some years, and yet consumers are not taking hold. The opinion is general that the next four to six months in the steel business will be very dull, with a strong probability of lower prices all along the line. On material for Pacific coast delivery, lower prices are being named than for inland shipment.

Pig Iron.—The market is still dull and prices are weak. The Standard Sanitary Mfg. Company bought last week 1500 tons of No. 2 foundry at $13.75, Valley furnace, and 750 tons of gray forge at $13.40, Valley furnace, for its North Side and New Brighton works for delivery over the remainder of the year. The American Steel Foundries has bought 1000 tons of basic iron at $14.25 delivered, part of this figuring at $14 at seller's furnace and part at slightly less than $13.75. The company is expected to buy additional iron for its Alliance works in the near future. There is no inquiry for Bessemer, which is nominally $15.75 at furnace, but $15.50 or less could be done if any business was coming out. We quote: Bessemer, nominally, $15.75; basic, $13.75 to $14; No. 2 foundry, $13.75 to $14; malleable Bessemer, $14.25; gray forge, $13.40, all at Valley furnace, the freight rate for delivery in the Pittsburgh or Cleveland district being 90c. a ton.

Billets and Sheet Bars.—Small lots of billets and sheet bars are still being sold by two or three of the outside steel mills at considerably lower prices than the larger mills will accept. One such sale was for 500 tons of sheet bars which netted the seller less than $22 at mill. There is not much inquiry, as most consumers are covered by sliding scale contracts, but specifications are lighter, as none of the sheet or tin plate mills is running to full capacity on account of lack of orders. We quote open-hearth and Bessemer billets for prompt delivery and for shipment over remainder of the year at $22.50 to $23 and Bessemer or open-hearth sheet bars at $23 to $23.50, makers' mill, Pittsburgh or Youngstown. Prices on forging and axle billets have materially declined. We quote forging billets at $27 and axle billets at about $24 at maker's mill.

Steel Rails.—Small orders for standard sections for this year's delivery are being placed right along, ranging from 200 tons to 500 tons, with an occasional order for 1000 tons. The new demand for light rails continues active, the Carnegie Steel Company having received specifications and new orders in the past week for close to 2500 tons. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Muck Bar.—No sales are reported, but standard grades of muck bar are scarce. We quote best grades, made from all pig iron, at about $32, Pittsburgh. Eastern muck bar is being offered here at about $2 a ton less.

Plates.—The new demand is dull and prices are weak. Some new car orders have been placed and more inquiry is out than for some time. The Cambria Steel Company, Johnstown, Pa., in addition to 3200 steel underframes for the Buffalo, Rochester & Pittsburgh, has taken 100 coal hopper cars for another interest. New inquiries for cars include 3000 for the Buffalo, Rochester & Pittsburgh and 2500 for the Wabash. It is stated the Missouri Pacific has an inquiry out for 5000 cars. The Atlantic Coast Line has placed 1000 box cars and 300 flat cars with the Barney & Smith Company, Dayton, Ohio. The current demand for plates is dull, and while the steel car companies are still specifying at a fair rate, they are running mostly on old orders and will soon be short of work unless larger business is placed in the near future. We quote ¼ in. and heavier tank plates at 1.35c., Pittsburgh, but in a few cases some of the smaller mills have named 1.30c.

Structural Material.—The past two weeks have been dull as to new inquiry. The American Bridge Company has a contract for 20 steel barges for the American Steel & Wire Company, to be built at its Ambridge, Pa., plant, which will require about 3000 tons of plates and shapes. It is said that in some cases prices have gone in on new work that figure back very low on the material at the mill. We quote beams and channels up to 15 in. at 1.35c., Pittsburgh.

Wire Rods.—Mills report that specifications against contracts have slowed down a good deal and new inquiry is light. We quote Bessemer, open-hearth and chain rods at $26.50, Pittsburgh, but on any sizable business this price would be shaded.

Ferroalloys.—The recent reduction in prices of ferromanganese has not stimulated the demand, but, on the contrary, has caused consumers to hold off. Only an occasional carload is being sold, and it is intimated that the new price has been shaded. Prices on ferrosilicon are firm. We quote 80 per cent. foreign ferromanganese at $50, Baltimore, the freight rate to the Pittsburgh district being $2.16 a ton. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at $75; over 100 tons to 600 tons, $74; over 600 tons, $73, Pittsburgh. We quote 10 per cent. ferrosilicon at $22; 11 per cent., $23, and 12 per cent., $24, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnaces. We quote 20 per cent. spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12c. in lots up to 2000 lb.

Skelp.—While there is not much inquiry, the mills still have a good deal of old business on their books and are running quite full. Prices are fairly strong, but not enough new business is coming out to test the market. We quote grooved steel skelp at 1.35c. to 1.40c.; sheared steel skelp, 1.40c. to 1.45c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.65c. to 1.70c., delivered to buyers' mills in Pittsburgh district.

Iron and Steel Bars.—The new demand for steel bars has fallen off, but the mills report specifications from the railroads and other large consumers still coming in freely, and shipments are heavy. For some months the demand for steel bars has been better than on any other line of finished products, and specifications have also been larger. The steel bar mills are pretty well filled with actual orders for the remainder of this year, and, while reports are current of cutting in prices, the larger makers state they are firmly holding 1.40c. and have not as yet seen any necessity for reducing the price. The new demand for iron bars is only fair, and the mills being well caught up on deliveries are able to ship promptly. We quote steel bars for prompt or forward delivery at 1.40c. and iron bars at 1.55c. to 1.60c. Local warehouses are still charging 1.90c. on small lots of steel bars for spot delivery.

Sheets.—A number of large inquiries for both black and galvanized sheets are in the market for delivery over the next six months, but the mills are not keen to take this business at the low prices now ruling, believing that not later than about the first of the year there may be an improvement in the situation. A number of the small mills are very anxious for new business and, as a limited amount is being placed, competition is keen. Specifications against contracts are quiet, and operations among the sheet mills are not averaging over 60 per cent. of capacity. In some cases, No. 28 Bessemer black sheets have sold at 2c., with reports of a still lower price having been made, but most of the mills are adhering to 2.05c. and are taking business in a small way

at this price. Galvanized sheets have settled down to a basis of about 3.10c. for No. 28, but this price has also been shaded. Blue annealed sheets are lower, and while Nos. 9 and 10 are regularly quoted at 1.55c., this price has been shaded about $1 a ton. We quote Nos. 9 and 10 blue annealed sheets at 1.50c. to 1.55c.; No. 28 Bessemer black, 2.05c. to 2.10c.; No. 28 galvanized, 3.10c. to 3.15c.; No. 28 tin mill black plate, H.R. and A., 2.05c., and Nos. 29 and 30, 2.10c. These prices are f.o.b. Pittsburgh, in carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—Practically no new business is being placed. Nothing has yet been done in regard to fixing a price on taking contracts from the large consumers for winter and spring delivery. The mills are not urging that these contracts be placed, owing to the generally unsettled conditions in the steel trade, and the difficulty in knowing just what prices are ruling for semi-finished steel. Contracts have been pretty well cleaned up, and at present most mills are not operating to more than 50 to 60 per cent. of capacity, with a few running nearly full. Much of the tin plate now being made is going into stock, and operations will probably quiet down still more. We quote 100 lb. cokes at $3.50 and 100 lb. ternes at $3.35, in carload and larger lots, f.o.b. Pittsburgh.

Railroad Spikes.—The local market is dull, there being litlte new demand and practically no specifications. Some of the railroads occasionally buy small lots, but there is no desire to contract, and all the spike makers are pretty badly in need of new business. We quote railroad spikes in base sizes, 5½ x 9/16 in., at $1.55 and small railroad and boat spikes in carloads at $1.75 per 100 lb., f.o.b. Pittsburgh. If any large business was coming out, it is likely these prices would be shaded.

Bolts and Rivets.—Makers of nuts and bolts report that the new demand is better than it was six weeks ago, but is still confined mostly to small lots to cover actual needs. An adjustment in discounts on nuts and bolts to a lower basis is likely in the near future. The new demand for rivets is quiet, and only for small lots. We quote button head structural rivets at $1.85 in large lots and $1.95 in small lots and cone head boiler rivets at $1.95 in large lots and $2.05 in small lots, terms 30 days net, less 2 per cent. for cash in 10 days. Discounts on nuts and bolts, which are being shaded on any desirable business, are as follows: In lots of 300 lb. or over, delivered within a 20c. freight radius of makers' works:

Coach and lag screws	80 and 10% off
Small carriage bolts, cut threads	75 and 5% off
Small carriage bolts, rolled threads	75 and 10% off
Large carriage bolts	70 and 2½% off
Small machine bolts, cut threads	75 and 10% off
Small machine bolts, rolled threads	75, 10 and 5% off
Large machine bolts	70 and 7½% off
Machine bolts with C.P.C. and T nuts, small	75 and 5% off
Machine bolts with C.P.C. and T nuts, large	70% off
Square hot pressed nuts, blanked and tapped	$5.70 off list
Hexagon nuts	$6.30 off list
C.P.C. and R. square nuts, tapped and blank	$5.70 off list
Hexagon nuts, ¾ and larger	$6.60 off list
Hexagon nuts, smaller than 9/16	$7.20 off list
C.P. plain square nuts	$5.20 off list
C.P. plain hexagon nuts	$5.50 off list
Semi-finished hexagon nuts, ¾ and larger	85% off
Semi-finished hex. nuts, smaller than 9/16	85 and 10% off
Rivets, 7/16 x 6½, smaller and shorter	75, 10 and 10% off
Rivets, metallic tinned, bulk	3½c. per lb. net extra
Rivets, tin plated, bulk	1½c. per lb. net extra
Rivets, metallic tinned, packages	70, 10 and 10% off
Standard cap screws	75, 10, 10 and 7½% off
Standard set screws	75, 10, 10 and 7½% off

Shafting.—There is no improvement to note in the shafting trade, the new demand being dull, and specifications are very unsatisfactory. Prices are weak, and we quote cold rolled shafting at 62 to 63 per cent. off in carloads and larger lots, and 55 to 60 per cent. off in small lots, delivered in base territory.

Hoops and Bands.—Very little new business is being placed and only in small lots, consumers being covered ahead for some time, but specifications are light. We quote bands at 1.40c., extras as per the steel bar card, and steel hoops at 1.60c., Pittsburgh. If any large business were offering these prices would be shaded.

Wire Products.—The wire trade is in an unsatisfactory condition, the new demand being light and specifications only fair. The market is uneven and wire nails are being offered at $1.60 and plain annealed wire at $1.40 by practically all of the makers. It is stated that in exceptional cases these low prices, which are said to be very close to cost, have been slightly shaded. We quote wire nails to jobbers $1.60; cut nails, $1.60; plain annealed wire, $1.40; galvanized barb wire, $2, and painted barb wire, $1.60 f.o.b., Pittsburgh, per 100 lb., usual terms, actual freights added to points of delivery.

Merchant Steel.—New demand is quiet and only for small lots to cover current needs, while specifications are light. The market is weak, but general asking prices are about as follows: Iron-finished tire, 1½ x ½ in. and larger, 1.35c., base; under 1½ x ½ in., 1.50c.; planished tire, 1.55c.; channel tire, ¾ to ⅞ and 1 in., 1.85c. to 1.95c.; 1⅛ in. and larger, 1.95c.; toe calk, 1.95c. to 2.05c., base; flat sleigh shoe, 1.70c.; concave and convex, 1.75c.; cutter shoe, tapered or bent, 2.25c. to 2.35c.; spring steel, 1.95c. to 2.05c.; machinery steel, smooth finish, 1.80c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1½ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter gauges and sizes.

Standard Pipe.—Current demand for lap weld pipe and oil country goods is fair, but jobbers are inclined not to buy any more pipe than is actually needed to round out stocks in view of the expected re-adjustment in prices to a lower basis, which is looked for to occur not later than November 15. The Louisville Gas & Electric Company has placed 8 miles of 16-in. line pipe with a Youngstown mill. Pipe mills are running to practically full capacity and have a fair amount of work ahead. Discounts are only being fairly well observed. The Standard Oil Company has placed an order for 30 miles of 8-in. pipe with a local mill for shipment to Mexico and the Ohio Fuel Supply Company has given orders for a considerable tonnage of 3 to 10-in. to a Western mill.

Boiler Tubes.—There is a fair new demand for boiler tubes, and prices are holding quite steady. For seamless tubing demand is good, and the two leading makers are said to be pretty well filled up over remainder of the year. Discounts on iron and steel boiler tubes are only fairly well maintained.

Old Material.—The scrap trade continues in very unsatisfactory shape, there being practically no new demand, and while there are no actual embargos, several of the large consumers have asked for suspension of shipments, as scrap is being delivered to them faster than they can use it. While prices are lower than they have been in some years, consumers are not anticipating, and there is little or no new buying. Prices on nearly all grades of scrap are off from 25c. to 50c. per ton, and offers to furnish selected heavy steel scrap at $12 delivered at consumers' mills have been turned down. We have reduced prices from 25c. to 50c. per ton, and about the only lines of scrap for which there is any demand are borings and turnings. Sales of about 400 tons of turnings are reported at a price close to $7 delivered, consumers' mills. Dealers are now quoting about as follows per gross ton for delivery in the Pittsburgh and other districts:

Selected heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$12.00 to	$12.25
Ordinary steel scrap	11.75 to	12.00
Compressed side and end sheet scrap		10.25
No. 1 foundry cast	12.50 to	12.75
No. 2 foundry cast	11.25 to	11.50
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	7.00 to	7.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.		13.50
No. 1 railroad malleable stock	11.25 to	11.50
Grate bars	8.00 to	8.25
Low phosphorus melting stock	15.00 to	15.25
Iron car axles	24.25 to	24.75
Steel car axles	17.25 to	17.50
Locomotive axles, steel	20.75 to	21.25
Locomotive axles, iron	25.25 to	25.75
No. 1 busheling scrap		11.50
No. 2 busheling scrap		7.00
*Machine shop turnings	6.75 to	7.00
Old carwheels	13.50 to	13.75
*Cast-iron borings	8.00 to	8.25
†Sheet bar crop ends	13.75 to	14.00
Old iron rails	14.25 to	14.50
No. 1 railroad wrought scrap	13.50 to	13.75
Heavy steel axle turnings	8.75 to	9.00
Stove plate	8.00 to	8.25

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

Coke.—There is practically no new inquiry for coke, and while one interest is still maintaining its price at $2.50, small lots of furnace coke sufficient to meet the present demand are being offered at $2 to $2.15 per net ton at oven. There is some talk of contracts for furnace coke for first half of next year, but nothing definite has been done. It is intimated that furnaces would be willing to pay about $2 for standard brands of furnace coke for first half of 1914, but this price is below the ideas of the makers. We quote standard makes of furnace coke for delivery over the remainder of the year at $2 to $2.15 per net ton at oven, strictly

high-grade quality coke bringing the higher price. There is a fair amount of new inquiry for foundry coke, and prices are fairly satisfactory. We quote best makes of 72-hr. foundry coke at $2.75 to $3 per net ton at oven. The Connellsville, Pa., Courier reports output of coke in the Upper and Lower Connellsville districts for the week ended October 11, as 386,890 tons, an increase over the previous week of about 28,000 tons. These figures of production are disputed by many in the trade, who claim they are entirely too high.

Chicago

CHICAGO, ILL., October 22, 1913.—(*By Telegraph.*)

The past week, while it did not bring out business that had not been anticipated, was encouraging in that a number of orders for rails and cars were actually placed. The rail order for the Great Northern for 1914 delivery, aggregating 40,000 tons, has been distributed. Orders for 10,000 tons of steel for the Chicago & North Western cars have also been placed, and it now appears that early reports of quiet car buying were conservative rather than otherwise. Of the Western roads, the Great Northern, Missouri Pacific, Burlington and Harriman lines are in the market for rolling stock. The shortage in coal cars, which is always most pronounced at this season, has been in a measure responsible for this activity. Accompanying the rail orders the railroads have contracted for liberal quantities of track fastenings. Aside from railroad transactions, the local market for the past week offers little that is new. Prices for steel products have marked time, although what were recently inside quotations are now more general. The pig-iron market has been very quiet.

Pig Iron.—With the exception of one order of 1000 tons of foundry iron for Kansas City delivery and similar purchases by the same buyer for consumption at its other plants, activity in pig iron has been limited to small lots. Sellers of iron maintain an attitude of firmness and with the exception of Southern iron are generally asking an advance for next year's delivery. The impression prevails, however, that when the new year arrives iron will be available at the same price as now prevails for last quarter shipment, and accordingly melters are disposed to delay their first half contracting and are filling in meanwhile with small tonnages. Quotation for Northern iron continue on the basis of $15, f.o.b. furnace, and for Southern iron at $11.50, Birmingham. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4	$15.25 to $15.75
Northern coke foundry, No. 1	15.50 to 16.00
Northern coke foundry, No. 2	15.00 to 15.50
Northern coke foundry, No. 3	14.50 to 15.00
Southern coke, No. 1 foundry and No. 1 soft	16.10 to 16.60
Southern coke, No. 2 foundry and No. 2 soft	15.60 to 16.10
Southern coke, No. 3	15.10 to 15.60
Southern coke, No. 4	14.60 to 15.10
Southern gray forge	14.60 to 15.10
Southern mottled	14.10 to 14.60
Malleable Bessemer	15.00 to 15.50
Standard Bessemer	18.40
Basic	15.00 to 15.50
Jackson Co. and Kentucky silvery, 6 per cent	18.40
Jackson Co. and Kentucky silvery, 8 per cent	19.40
Jackson Co. and Kentucky silvery, 10 per cent	20.40

(*By Mail*)

Rails and Track Supplies.—The formal placing of a round tonnage of rails during the last week, including the Great Northern Railway's award of 25,000 tons to the Illinois Steel Company, 5,000 tons each to Lackawanna, Bethlehem and Cambria Steel companies was a welcome relief from the prevailing dullness. Accompanying these orders and other rail orders also placed, were liberal contracts for track fastenings. Although the extent to which the several railroads whose rail inquiries for 1914 have been under negotiation here, have closed during the week cannot be determined, indications point to purchases very satisfactory to the mills. We quote standard railroad spikes at 1.70c. to 1.75c., base; track bolts with square nuts, 2.25c., base, all in carload lots, Chicago; tie plates, $30 to $32, net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Materials.—Orders for about 10,000 tons of steel for the underframes of the Chicago & Northwestern cars were placed last week with the local mills of the leading interest. Other car orders include an aggregate of about 800 passenger cars for various roads and it is stated that the Missouri Pacific and Great Northern roads are in the market for freight cars. The demand for structural steel is very light, the only prospect in Chicago being the Lumberman's building, which will replace the Roanoke building at Madison and LaSalle streets. Contracts for fabricated steel placed during the week include 274 tons for mines of the Oliver Iron Mining Company at Ironwood, Mich., awarded to the American Bridge Company, which will also furnish 573 tons for a new building for the church of Latter Day Saints at Salt Lake City. The Toledo Bridge & Crane Company will fabricate 338 tons for a Scherzer lift bridge to be erected in Lake County, Ind., and the Minneapolis Steel & Machinery Company will furnish 101 tons for the Yakima Hardware Company at Yakima, Wash. The total tonnage of open business in the market from which to determine the prevailing price is too small to have much significance. For delivery to fabricators or jobbers there appears to be less weakness in structural prices than in other steel products. For Chicago delivery we continue to quote 1.58c.

Orders for structural steel from store are few in number and light in tonnage. We quote for Chicago delivery 1.95c.

Plates.—The price at which plates may be placed has come to depend upon the specifications in each case. Desirable orders are undoubtedly bringing out concessions, the extent of which can only be surmised. Quotations based on 1.35c. Pittsburgh are now common. For the Los Angeles aqueduct pipe line orders were placed for 2815 tons of plates and shapes the last week, the material to be furnished by the Lacy Mfg. Company and the Llewellyn Iron Works. For Chicago delivery from mill we quote 1.53c. to 1.58c.

Jobbers report their plate business out of stock as very light while the accounts for which mill business is handled are practically at a standstill. For Chicago delivery we quote from store 1.95c.

Sheets.—From the standpoint of tonnage current orders for sheets total a very fair volume, but business is entirely for prompt shipment. The jobbers in particular are insistent in their demands for delivery, for the reason that their stocks are low in anticipation of further declines in prices. Thus far the decline in sheet prices has been the most pronounced of all the finished steel lines, the total recession approximating $9 per ton. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.73c. to 1.78c.; No. 28 black, 2.23c.; No. 28 galvanized, 3.23c.

Out of store the business in sheets is very light. This is evidenced by the fact that insufficient business has appeared to bring about a reduction in the store price of sheets in keeping with the mill reductions. We continue to quote without change as follows: No. 10 blue annealed, 2.15c.; No. 28 black, 2.75c.; No. 28 galvanized, 3.80c.

Bars.—Activity in steel bars is confined to routine specifications, little or no new business materializing. Some business is known to have been placed in the past week on a 1.35c. Pittsburgh basis, but this quotation is not the open market. Fair orders for bar iron are reported but they are being secured through price concessions. One mill which has been especially active in securing business is running at about capacity in contrast to most of the other mills of this district, which are operating from 50 to 70 per cent. Hard steel bars are being held with a degree of firmness with occasional concession of $1 a ton. We quote for mill shipment as follows: Bar iron, 1.25c., soft steel bars, 1.58c.; hard steel bars, 1.40c. to 1.50c.; shafting in carloads, 60 per cent. off; less than carloads, 55 per cent. off.

For delivery from store we quote soft steel bars, 1.85c.; bar iron, 1.85c.; reinforcing bars, 1.85c. base, with 5c. extra for twisting in sizes ½ in. and over, and usual card extras for smaller sizes; shafting 55 per cent. off.

Rivets and Bolts.—There is little to be said concerning rivets and bolts which does not accentuate the weakness of the situation in these products. Business is light and prices irregular. We quote from mill as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 75-10-7½; cut thread, 75-12½; larger sizes, 70-12½; machine bolts up to ⅜ x 4 in., rolled thread, 75-10-12½; cut thread, 75-10-7½; large size, 70-10-5; coach screws, 80-12½-5; hot pressed nuts, square head, $6 off per cwt.; hexagon, $6.70 off per cwt. Structural rivets, ¾ to 1¼ in., 1.98c. to 2.03c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Out of store we quote for structural rivets, 2.70c., and for boiler rivets, 2.90c. Machine bolts up to ¾ x 4 in., 70-5-10; larger sizes, 70-7½; carriage bolts up to ⅜ x 6 in., 75-5; larger sizes, 70-7½ off. Hot pressed nuts, square head, $5.50, and hexagon, $6.20 off per cwt.

Wire Products.—The market with respect to the various forms of plain wire and manufactured products present no new developments. Specifications are routine in character and in volume are well up to contract

schedules. Prices to jobbers are as follows: Plain wire, No. 9 and coarser, base, $1.63; wire nails, $1.83; painted barb wire, $1.83; galvanized, $2.20; polished staples, $1.83; galvanized, $2.15, all Chicago.

Cast-Iron Pipe.—With the exception of two 150-ton pipe orders there were no municipal awards of consequence during the week. Routine orders of small size were fair. We quote as follows, per net ton, Chicago: Water pipe, 4-in., $28; 6 to 12-in., $26; 16-in. and up, $25, with $1 extra for gas pipe.

Old Material.—The local scrap market remains unchanged except for the further recessions in price. Quotations on the small tonnages involved in current market transactions approach low records for scrap in this market. About the only remaining matters of interest are the railroad lists that appear each week and the prices at which they are disposed of. Current lists include 2600 tons from the Chicago, Milwaukee & St. Paul, of which 1100 tons of steel rails is the principal item, 880 tons from the Chicago, Minneapolis, St. Paul & Omaha, 1150 tons from the Union Pacific and small lists from the New York Central Lines and the Chicago & Alton. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails	$13.50 to $14.00
Old steel rails, rerolling	12.00 to 12.50
Old steel rails, less than 3 ft.	11.25 to 11.75
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	12.00 to 12.50
Heavy melting steel scrap	10.00 to 10.50
Frogs, switches and guards, cut apart	10.00 to 10.50
Shoveling steel	9.00 to 9.50
Steel axle turnings	7.25 to 7.75

Per Net Ton.

Iron angles and splice bars	$13.25 to $13.75
Iron arch bars and transoms	12.75 to 13.25
Steel angle bars	9.25 to 9.75
Iron car axles	20.25 to 20.75
Steel car axles	14.00 to 14.50
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	8.50 to 9.00
Cut forge	8.50 to 9.00
Steel knuckles and couplers	9.75 to 10.25
Steel springs	9.75 to 10.25
Locomotive tires, smooth	11.00 to 11.50
Machine shop turnings	4.50 to 5.00
Cast borings	4.50 to 5.00
No. 1 busheling	7.75 to 8.25
No. 2 busheling	6.25 to 6.75
No. 1 boilers, cut to sheets and rings	7.00 to 7.50
Boiler punchings	10.25 to 10.75
No. 1 cast scrap	10.25 to 10.75
Stove plate and light cast scrap	9.25 to 9.75
Railroad malleable	9.50 to 10.00
Agricultural malleable	9.00 to 9.50
Pipes and flues	7.25 to 7.50

Philadelphia

PHILADELPHIA, PA., October 21, 1913.

The iron market is more apathetic. Buyers are taking current small lots and holding back on purchases for extended delivery, awaiting further developments, as is customary when the market shows softening tendencies. Pig iron has developed no important features; prices, as a rule, hold pretty firmly. Conflicting reports as to a purchase of foreign or domestic steel billets by a Virginia consumer are heard. Basic open-hearth rolling steel is available at less than $25 delivered here. Price irregularities in plain shapes are more pronounced than in plates. Both iron and steel bars have been quiet. More inquiry for fabricated structural work is reported. The old material market drags. The demand for coke is light.

Iron Ore.—The market is quiet, there being little demand for either foreign or domestic ore. Importations at this port last week, including October 17, showed a total of 22,500 tons from Cuba, 4800 tons from Canada and 3625 tons from Venezuela.

Pig Iron.—In the higher foundry grades business has been closely confined to small prompt lots. On this class of business makers of standard brands have been maintaining prices pretty firmly; in but few cases have concessions from $16, delivered, for standard eastern Pennsylvania No. 2 X foundry been made. Here and there sellers of less desirable brands have quoted down to $15.75, delivered, but $15 at furnace is practically the minimum. Inquiry has been light, the most important being that of the Baldwin Locomotive Works, for 1000 to 1500 tons of No. 2 X foundry for delivery over the remainder of the year. Virginia producers report comparatively light sales, practically all small lots and for delivery this year. Prices of No. 2 X foundry are well maintained at $13 to $13.25 at Virginia furnace. It is stated that a New Jersey consumer, figuring on several thousand tons of foundry iron, on which both Virginia and eastern Pennsylvania makers were figuring, has deferred purchases for a time. A malleable iron maker in this vicinity has an inquiry out for some 500 tons of coke malleable, for early November delivery. Cast-iron pipe makers are still negotiating for a considerable tonnage of low grade pipe iron, but few sales are reported. The scarcity of Northern low grade as well as the different ideas of makers and buyers as to prices retards business. Importation of foreign iron, either Middlesbrough No. 3 or Scotch iron, has not been a factor, owing to the higher cost compared with domestic irons. There has been more business in rolling mill forge iron, a Schuylkill Valley producer-consumer taking some 3500 tons, delivery over the next few months, at a reported price of $15 to $15.25 delivered. Steel making grades have not been active. A sale of 1500 tons of basic, for delivery in the first quarter of next year, at $15.75 delivered, is reported. A melter in this district is still negotiating for several thousand tons of basic for this year's shipment. Standard analysis low phosphorus iron has been in light demand, but prices are well maintained. Lebanon Valley low phosphorus has been somewhat more active. A sale of 1000 tons at $18 at furnace was made last week. Buyers still withhold inquiries in almost all grades for extended forward delivery, and few quotations for early 1914 shipment have been made. Under the circumstances, the market has not been seriously tested and prices of standard brands are practically unchanged. The following range is named for deliveries in buyers' yards in this district, shipment extending over the remainder of the year:

Eastern Pennsylvania No. 2 X foundry	$16.00 to $16.25
Eastern Pennsylvania No. 2 plain	15.75 to 16.00
Virginia No. 2 X foundry	15.80 to 16.25
Virginia No. 2 plain	15.75 to 16.00
Gray forge	15.00 to 15.25
Basic	15.25 to 15.50
Standard low phosphorus	23.00 to 23.50

Ferroalloys.—Business has been confined to small lots of 80 per cent. ferromanganese for either prompt or near future delivery at $50, seaboard, for English and $49 to $49.50, seaboard, for German. No demand for forward ferromanganese has developed. Ferrosilicon remains quiet. Importations of ferromanganese during the week aggregated 131 tons.

Billets.—A sale of 1000 tons of small steel billets to a Virginia consumer is reported. Competition by sellers of German billets was sharp, and it has not been definitely learned whether foreign or domestic steel was taken. The demand for both rolling and forging billets has been comparatively light. Small lots of basic open-hearth rolling billets have been sold at $25, delivered in this vicinity, but on any sizeable business $24 could readily be done. Specifications on contracts are fair, but mills are not actively engaged. Forging steel is only in fair demand, and ordinary analysis steel is nominally quoted at $30.

Plates.—New business continues irregular. One Eastern mill continues to get a good volume of business, covering a wide range of material. In instances orders for upward of 1000 tons have been taken at full prices. Reports are heard of price concessions, but little business is openly taken under 1.55c. delivered here. The bulk of the current miscellaneous business is done on that basis. Considerable boat plate business is pending, while recent orders include good quantities of bridge and tank plates.

Structural Material.—While there has been a somewhat greater volume of business offered, competition is keen and 1.50c., delivered here, for plain shapes is now considered an open quotation. Mill operations have been gradually declining, and in instances there has been some decrease in operating forces. An inquiry for 1000 tons of structural material for the Norfolk & Western Railway is before the trade, while an inquiry for a 4000 to 5000 ton bridge for the Baltimore & Ohio is reported. The Pennsylvania Railroad has some small bridge work under estimate. Specifications for several small buildings are also being figured on. Prices have been weak, and the market for plain structural shapes ranges from 1.50c. to 1.55c., delivered in this district.

Sheets.—Eastern mills continue to receive a fair amount of miscellaneous orders, but the aggregate tonnage continues light. Business continues irregular owing to the weakness of prices and few consumers are willing to contract for forward requirements. Western No. 10 blue annealed sheets are quoted at about 1.75c., delivered here, which price is usually met by Eastern producers.

Bars.—The demand for either steel or iron bars has been comparatively light. Consumers take only sufficient for current needs, awaiting further develop-

ments as to prices. Under the circumstances mills are not forcing sales, to do which would mean price concessions. Current business in ordinary iron bars is moving at prices around 1.32½c. to 1.37½c., delivered in this district, although better grades command up to 1.42½c. A fair volume of specifications is coming out for steel bars, but new orders are light. Quotations appear to be maintained at 1.55c., delivered in this vicinity.

Coke.—A moderate volume of business has been moving in foundry coke at prices ranging from $3 to $3.15 at oven. The bulk of the sales have been for this year's delivery. Forward furnace coke, which continues to be held at $2.50 at oven, is inactive, but a fair volume of business in prompt coke is moving at $2 to $2.25, according to grade. The reduction in freight rates to points in this district makes delivered prices from 5c. to 20c. per ton lower. The following range, per net ton, delivered in buyers' yards in this district about represents the market:

Connellsville furnace coke	$4.05 to $4.40
Connellsville foundry coke	4.90 to 5.35
Mountain furnace coke	3.85 to 4.10
Mountain foundry coke	4.60 to 4.85

Old Material.—A lull has followed the recent buying movement, as most consumers are well supplied and have lowered their offering prices. Transactions in heavy melting steel have been almost entirely between merchants, who pay better prices than mills, purchases applying on old higher priced contracts. The rolling mill grades have been exceedingly quiet, and there is almost an entire absence of demand for rerolling specialties. Both buyers and sellers are awaiting developments and meanwhile prices quoted are largely nominal. An approximate range for delivery in buyers' yards in this district, covering eastern Pennsylvania, taking freight rates varying from 35c. to $1.35 per gross ton, is as follows:

No. 1 heavy melting steel	$11.00
Old steel rails, rerolling (nominal)	$14.00 to 14.50
Low phosphorus heavy melting steel scrap (nominal)	16.00
Old steel axles	18.00 to 18.50
Old iron axles (nominal)	25.00
Old iron rails	17.50 to 18.00
Old carwheels	12.00 to 12.50
No. 1 railroad wrought	14.00
Wrought-iron pipe	10.75 to 11.00
No. 1 forge fire	9.00 to 9.50
No. 2 light iron (nominal)	6.00
No. 2 busheling (nominal)	8.00 to 8.25
Wrought turnings	7.75 to 8.00
Cast borings	7.75 to 8.00
Machinery cast	13.50 to 14.00
Grate bars, railroad	9.00 to 9.50
Stove plate	9.50 to 10.00
Railroad malleable (nominal)	11.00 to 11.50

Cincinnati

CINCINNATI, OHIO, October 22, 1913.—(*By Telegraph.*)

Pig Iron.—The only change to be noted is a slight betterment in the inquiry. In addition to the unclosed orders previously reported from Indiana, there are two requests for prices from buyers in that State for 500 tons each of Southern foundry iron for first half shipment. An Ohio melter is asking for 1000 tons and will probably contract for Southern foundry iron. There is so little business being done that it is hardly practicable to state whether or not the minimum quotation of $11.50, Birmingham, has been firmly established. Part of the prompt shipment Southern iron now being sold has been bought below this figure, and practically all furnaces are willing to accept business for first half shipment at the price named, which would indicate lower figures for spot delivery material. There is some little activity in malleable, but the largest inquiry out is for 1000 tons from a Central Western consumer, to be shipped during the next six months. A Central Western steel company is expected to come in the market soon for a quantity of basic iron, but no definite inquiry has yet been put out. Northern foundry iron is stationary at $14, Ironton, for No. 2. This same price can be inserted in contracts for deliveries extending throughout the first half. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft	$15.00 to $15.50
Southern coke, No. 2 foundry and 2 soft	14.50 to 15.00
Southern coke, No. 3 foundry	14.00 to 14.50
Southern, No. 4 foundry	13.50 to 13.75
Southern gray forge	13.00 to 13.50
Ohio silvery, 8 per cent. silicon	18.20 to 18.70
Southern Ohio coke, No. 1	16.20 to 16.70
Southern Ohio coke, No. 2	15.20 to 15.70
Southern Ohio coke, No. 3	14.95 to 15.45
Southern Ohio malleable Bessemer	15.20 to 15.45
Basic, Northern	15.20 to 15.45
Lake Superior charcoal	16.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

(*By Mail*)

Coke.—Prompt shipment Connellsville furnace grades are said to be obtainable below the regular published quotations. This weakness in furnace coke has been reflected in foundry grades. The nominal contract prices are around $2.10 to $2.50 per net ton at oven on 48-hour coke, with 72-hour standard brands hovering around $3. However, there are a number of 72-hour coke producers who will accept contract business below the figure named. On prompt shipment furnace coke as low as $2 can be done in some instances, and as the demand is rather slack it is difficult to state at what price future contracts could be made. Wise County and Pocahontas producers have felt the effect of the low Connellsville prices prevailing, and as a consequence have been accepting business below previous quotations, although it is stated that nothing below $2.25 can be done on 48-hour grades, while the average price of foundry coke is between $2.75 to $3, for either prompt or deferred shipment.

Finished Material.—Reports as to quiet business in almost all lines are not very much exaggerated. The railroads have slackened in placing orders, but there is enough booked ahead in this territory to give local mill agencies chance for an extended breathing spell. Shipments on contracts are holding up well, but there is something of a scramble for an order, no matter how small it may be. Local prices are unchanged. No. 28 black sheets are firm at 2.20c. to 2.25c., and galvanized sheets at 3.25c., f.o.b. Cincinnati, in carload lots. Several contracts for structural material are in sight in this territory, but it is doubtful if the larger ones will be let for two months yet.

Old Material.—The local market is still somewhat demoralized. No stable prices are quoted, due, it is stated, to the large stocks on hand and the limited demand. Dealers are keen for business, but are extremely slow in making offers on any kind of scrap material. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	$7.00 to $7.50
Old iron rails	12.00 to 12.50
Relaying rails, 50 lb. and up	19.75 to 20.25
Rerolling steel rails	11.00 to 11.50
Melting steel rails	9.50 to 10.00
Old carwheels	10.75 to 11.25

Per Net Ton.

No. 1 railroad wrought	$9.00 to $9.50
Cast borings	4.50 to 5.00
Steel turnings	4.50 to 5.00
No. 1 cast scrap	9.00 to 9.50
Burnt scrap	6.50 to 7.00
Old iron axles	16.75 to 17.25
Locomotive tires (smooth inside)	10.25 to 10.75
Pipes and flues	6.00 to 6.50
Malleable and steel scrap	7.50 to 8.00
Railroad tank and sheet scrap	4.75 to 5.25

Cleveland

CLEVELAND, OHIO, October 21, 1913.

Iron Ore.—Some Lake Superior mining companies have accumulated large stock piles for which no market has been found this year. With the heavy tonnage sold last winter for this season's delivery and the promising outlook for the season, work at many of the underground mines was speeded up early in the year so that a maximum output was mined. Mining operations were kept up at this rate until late in the season, but a late buying movement did not materialize and as a result considerable ore is unsold. Lake shipments during October will not show much falling off in October from those of September. However, the movement will soon begin to slow down considerably. Barges of the Pittsburgh Steamship Company will start to lay up next week. No barges will be sent up the lakes after October 25 and they will probably all be in winter quarters by November 1. We quote prices as follows: Old range Bessemer, $4.40; Mesaba Bessemer, $4.15; old range non-Bessemer, $3.50; Mesaba non-Bessemer, $3.40.

Pig Iron.—The market is very dull. There is a limited demand for small lots of foundry iron for the last quarter delivery, but foundries are not buying for delivery after January 1, and sellers do not look for an active buying movement for the first half for several weeks. Prices on foundry iron for the last quarter delivery are somewhat easier. Several Valley makers

will quote $13.75 for No. 2, for delivery until January 1. While the $11.50 Birmingham price is generally quoted for No. 2 Southern iron, there are reports that this price can be shaded to $11 for delivery through the last quarter. For prompt shipment and for the last quarter we quote, delivered Cleveland, as follows:

Bessemer	$16.65
Basic	14.90
Northern No. 2 foundry	$14.65 to 14.90
Southern No. 2 foundry	15.35 to 15.85
Gray forge	14.25
Jackson County silvery, 8 per cent. silicon	18.55 to 19.05

Coke.—Very little new business is coming out. Most consumers of foundry grades are covered with contracts and the demand for fuel under these contracts is holding up well. Standard Connellsville foundry coke is quoted at $2.85 to $3 per net ton at oven. However, a few makers are still asking $3.20. Connellsville furnace coke for prompt shipment is being offered as low as $2. For contract the price ranges from $2.10 to $2.25.

Finished Iron and Steel.—The market is quiet with buying limited almost entirely to small lots for immediate delivery. Some new low prices have developed. However, in spite of rumors of lower quotations, the price on steel bars appears to be firmly maintained in this market at 1.40c., Pittsburgh. Keen competition has developed for plate business, but most of the larger mills are quoting 1.35c., Pittsburgh. Sales of plates to be used in fabricated work for export, however, have been made as low as 1.25c. Western bar iron prices are weaker and an interesting feature of the market is the sale of bar iron by Chicago mills in Cleveland at 1.20c. at mill or 1.35c. delivered. Local mills have reduced bar iron prices $1 a ton, to 1.35c. at mill. For shipment to the Ohio and Michigan territory a quotation of 1.22½c. is being made quite general by Chicago mills and these low prices are bringing out a fair volume of business that would normally go to steel bar mills. Quotations on hard steel bars have been reduced $1 a ton to 1.35c. Among the local inquiries for steel bar products is one for 5000 to 6000 tons of spring steel. Structural material is generally maintained at 1.40c., Cleveland. The contract for the steel for the Cleveland Railway Company buildings requiring 800 tons has been let to T. H. Brooks & Co. The Carnegie Steel Company has taken 3250 tons of plates and shapes for an ore boat to be built by the American Shipbuilding Company. Lower prices are being quoted on sheets, which seem to have reached the bottom. The low quotations have stimulated buying somewhat. The Ohio sheet mills are now generally using their mills instead of Pittsburgh as the basing point. We quote No. 28 black sheet at 2c. to 2.05c., No. 28 galvanized at 3.05c. to 3.10c., and No. 10 blue annealed at 1.55c. to 1.60c. The Lackawanna Steel Company has taken 500 tons of 80-lb. rails for the Detroit & Toledo Shore Line Railroad. There is a local inquiry for 750 kegs of spikes. Warehouse prices are unchanged at 2c. for steel bars and 2.10c. for plates and structural material.

Old Material.—The market is very weak and quotations on several grades have declined. Prices are now apparently close to the bottom. The demand is very light. Some small lot sales are being made, but mills are buying only for immediate requirements and the absence of transactions make quotations on some grades merely nominal. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton.

Old steel rails, rerolling	$12.50 to $13.00
Old iron rails	12.50 to 13.00
Steel car axles	17.00 to 17.50
Heavy melting steel	10.25 to 10.50
Old carwheels	12.00 to 12.50
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	9.50 to 10.00
Railroad malleable	11.00 to 11.50
Light bundled sheet scrap	7.00 to 7.50
Bundled tin scrap	11.00 to 11.50

Per Net Ton.

Iron car axles	$20.00 to $21.00
Cast borings	5.75 to 6.00
Iron and steel turnings and drillings	4.25 to 4.50
Steel axle turnings	6.00 to 6.50
No. 1 busheling	9.00 to 9.50
No. 1 railroad wrought	10.50 to 11.00
No. 1 cast	11.00 to 11.25
Stove plate	8.00 to 8.50

Harry Bialosky & Co. have succeeded to the business of Harry Bialosky, continuing at 554 and 555 Leader News Building, Cleveland, Ohio. A. Rotter & Co. are in process of dissolution, but it will take some little time until all their contracts are completed. Mr. Bialosky retains his interest with A. Rotter & Co., but that firm will do no further buying or selling.

British Buying Restricted

Continental Steel Is Pressed for Sale —American Buying of Belgian Bars

(*By Cable*)

LONDON, ENGLAND, October 22, 1913.

The market remains depressed. Buying is restricted and sentiment is poor. Output is being curtailed. Continental material is still pressed for sale. America is reported to have bought a few lots of Belgian merchant steel bars. Demand for semi-finished steel is slow. For Victoria an order for 9000 tons of steel rails was placed with the Lithgow Iron Works in New South Wales and 18,000 tons with Bolckow, Vaughan & Co., Middlesbrough. Pig-iron warrant stocks are 167,407 tons, against 170,716 tons last week. Canada is inquiring for good quantities of tin plates. We quote as follows:

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb. f.o.b. Wales, 12s. 10½d. ($3.13) against 13s. 1½d. ($3.19), a week ago.

(The following prices are per ton of 2240 lb.):

Cleveland pig-iron warrants (Tuesday), 51s. 9d. ($12.59) against 52s. ($12.65) a week ago.

No. 3 Cleveland pig iron, makers' price f.o.b. Middlesbrough, 52s. 3d. ($12.71), against 52s. 6d. ($12.77) a week ago.

Ferromanganese, £9 17s. 3d. ($48).

Steel sheet bars (Welsh), delivered at works in Swansea Valley, £4 15s. ($23.11).

Steel bars, export, f.o.b. Clyde, £6 7s. 6d. ($31.09), a decline of 2s. 6d.

Steel joists, 15-in., export f.o.b. Hull or Grimsby, £5 17s. 6d. ($28.59).

Steel ship plates, Scotch, delivered local yards, £7 7s. 6d. ($35.89).

Steel black sheets, No. 28, export f.o.b. Liverpool, £9 ($43.79), a decline of 5s.

Steel rails, export, f.o.b. works port, £6 7s. 6d. ($31.02).

(The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.):

German sheet bars, f.o.b. Antwerp, 85s. ($20.69), a decline of 2s. 6d.

German 2-in. billets, f.o.b. Antwerp, 80s. ($19.46).

German basic steel bars, f.o.b. Antwerp, £4 10s. ($21.89).

German joists, f.o.b. Antwerp, £5 5s. to £5 8s. ($25.55 to $26.28), a decline of 3s.

St. Louis

ST. LOUIS, MO., October 20, 1913.

The general attitude seems to be one of waiting for something to turn up. Reports seem to indicate that things are ripe for buying, once one side or the other determines that nothing is to be gained by marking time.

Pig Iron.—The demand has been confined to small lots for immediate needs. There is little inclination on the part of furnaces to sell beyond the last quarter. Foundries in territory tributary to this market are melting steadily and few are covered beyond the last quarter or perhaps until February. The near future is believed to hold prospects of a buying movement. The demand for iron already contracted for keeps up and there are no requests to hold back supplies. Hurry shipments have been interfered with by car shortage conditions. In sales there were a number of 200 and 300-ton lots. No. 2 Southern is firm at $11.50, Birmingham basis. Northern at $14, Ironton and Chicago No. 2 X $15.

Coke.—Transactions of the week have been for small lots. Contract coke is being urged forward and car troubles have been interfering with the movement considerably. By-product coke is selling at about $5.80, St. Louis delivery.

Finished Iron and Steel.—The week has been rather quiet so far as new business is concerned. There is no pressure for future delivery nor especially for present shipment except where car shortage threaten delays. The Southwesten railroads show no present indication to buy rails. The coal interests have entered the market in light rails quite decisively for their fall and winter extensions. In bars the feature is the demand for prompt shipment and the increasing strength of this product.

Old Material.—Foundries are taking only what they have contracted for, while rolling mill interests are refusing to receive even on contracts. Dealers are cautious about buying and then only at their own prices and conditions. Quotations are under the conditions nominal. We quote dealers' prices f.o.b. St. Louis:

	Per Gross Ton.	
Old iron rails	$11.00 to	$11.50
Old steel rails, rerolling	11.50 to	12.00
Old steel rails, less than 3 feet	8.50 to	9.00
Relaying rails, standard section, subject to inspection	22.50 to	23.00
Old carwheels	9.50 to	10.00
Heavy melting steel scrap	8.25 to	8.75
Shoveling steel	7.50 to	8.00
Frogs, switches and guards cut apart	8.00 to	8.50
	Per Net Ton.	
Iron angle bars	$9.50 to	$10.00
Steel angle bars	7.00 to	7.50
Iron car axles	17.00 to	17.50
Steel car axles	13.00 to	13.50
Wrought arch bars and transoms	11.00 to	11.50
No. 1 railroad wrought	8.25 to	8.75
No. 2 railroad wrought	7.50 to	8.00
Railroad springs	7.00 to	7.50
Steel couplers and knuckles	7.00 to	7.50
Locomotive tires, smooth	9.00 to	9.50
No. 1 dealers' forge	7.50 to	8.00
Mixed borings	3.00 to	3.50
No. 1 busheling	7.00 to	7.50
No. 1 boilers, cut to sheets and rings	4.00 to	4.50
No. 1 cast scrap	8.00 to	8.50
Stove plate and light cast scrap	6.00 to	6.50
Railroad malleable	7.00 to	7.50
Agricultural malleable	5.50 to	6.00
Pipes and flues	5.00 to	5.50
Railroad sheet and tank scrap	4.00 to	4.50
Railroad grate bars	5.50 to	6.00
Machine shop turnings	3.50 to	4.00
Bundled sheet scrap	3.00 to	3.50

Birmingham

BIRMINGHAM, ALA., October 20, 1913.

Pig Iron.—The price of Birmingham district pig iron remains at $11.50, f.o.b. furnace. The inquiry has not been as active and the volume of business reported is not great. A conservative manufacturer says: "The price is $11.50 both for spot and the first quarter of 1914. I do not believe anything under that figure can be done, unless the offer is very attractive and the manufacturer has certain grades of iron in storage which he is desirous of moving. Otherwise, it is strictly an $11.50 market, firm but not active." A sale of high silicon iron corresponding to No. 2 soft was made during the week. The latter grade is extremely scarce and in some instances fetches a premium. The blowing out of Alice furnace by the Tennessee Company on October 12 caused no surprise as that stack had been worked hard for a long time. This leaves only 20 active stacks in Alabama. The demand for delivery is insistent and is complied with only with difficulty, owing to the scarcity of some grades. The many small orders that came in during the week all specified quick delivery and were placed on the universal basis of $11.50. One interest holds out for $12 for the first quarter, but does not report sales at that figure. Furnacemen unite in the statement that they have not felt the new tariff nor had it mentioned in trading transactions, but some of them express the belief that the removal of the duty means that $13 will hereafter be about the maximum price for Birmingham iron. Two sales of 1500 tons each for 1914 delivery have been made on the $11.50 basis. Stocks on Alabama yards have been reduced to 110,000 tons of foundry and some basic. We quote, per gross ton, f.o.b. Birmingham furnaces (the top price being secured only in exceptional cases), as follows:

No. 1 foundry and soft	$12.00 to $12.50
No. 2 foundry and soft	11.50 to 11.75
No. 3 foundry	11.00 to 11.25
No. 4 foundry	10.75 to 11.00
Gray forge	10.50 to 10.75
Basic	11.50 to 11.75
Charcoal	24.50 to 25.00

Cast-Iron Pipe.—Some additional orders have been received by the pipe manufacturers, but none of them were large. Manufacture continues on the same basis and accumulations are reported as moving out. Soil-pipe makers report prices unsatisfactory and some are thinking of shutting down unless the market improves. No change has been made in prices. We quote f.o.b. works as follows, per net ton: 4-in., $22.50; 6-in. and upward, $20.50, with $1 added for gas pipe.

Coal and Coke.—Coke has weakened further the past week, and good foundry, heretofore selling at $3.75, was purchased at 25c. under that. The supply has been greater than the demand. We quote, per net ton, f.o.b. oven: Furnace coke, $3 to $3.50; foundry, $3.50 to $4.

Old Material.—The market has not recovered the briskness that marked the close of September. Conditions, however, are considered satisfactory, with a fair amount of trading going on. Machinery scrap is in demand. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles (light)	$15.00 to $15.50
Old steel axles (light)	15.00 to 15.50
Old iron rails	12.50 to 13.50
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	10.00 to 10.50
No. 1 country wrought	9.50 to 10.00
No. 2 country wrought	8.50 to 9.00
No. 1 machinery cast	10.00 to 10.50
No. 1 steel scrap	10.50 to 11.00
Tram carwheels	10.50 to 11.00
Standard carwheels	12.00 to 12.50
Light cast and stove plate	8.50 to 9.00

German Prices Still Receding

Numerous Cuts Reported—Pig Production Keeps Up—Looking to American Market

BERLIN, October 10, 1913.

The reports from the iron trade are still of a pessimistic tenor. The price movement has continued downward. Buying for home delivery has not shown any increased activity, though there is better export buying for a few products. A dispatch of yesterday from the lower Rhine region states that the price of heavy plates has dropped to 100 marks ($23.80); that bars are going at less than 95 marks ($22.61), and thin plates at less than 120 marks ($28.56). Although the Band Iron Association maintains an official list of 122.50 to 127.50 marks ($29.15 to $30.34) for bands, sales are being made as low as 120 marks ($28.56). The leading Essen newspaper says that dealers are selling bars at 95 marks ($22.61) with 1½ per cent. off. The Pig Iron Syndicate has given out reduced prices for Luxemburg qualities of pig iron, which average between 2 and 3 marks (48c. and 71c.). A reduction on tin plates of 2.50 marks (60c.) on double-boxes is mentioned in the reports.

The employment of the mills appears to be relaxing. The Essen newspaper already quoted says that they are now seldom demanding more than one to two weeks for delivery after receiving specifications. The same paper complains that Belgian works are now competing more sharply with German producers in outside markets; and, in particular, that they are selling bars for export at 91 marks ($21.66), f.o.b. Antwerp. Cases of restriction of production continue to be reported. It is mentioned that the Rothe Erde branch of the great Gelsenkirchener Company, located near Aachen, is about to shut down a part of its plant.

Production of Pig Iron Increasing

Notwithstanding the unfavorable state of the trade in general, the production of pig iron is still increasing. The production in September reached 1,589,000 metric tons. This is 50,000 tons less than in August, but the daily rate in September was about 100 tons greater than in August. Shipments of pig iron in September are reported to have been somewhat larger than in August, but stocks on hand now amount to 550,000 tons, as compared with 280,000 tons a year ago. It is assumed that the Coal Syndicate will continue with the Pig Iron Syndicate the joint arrangement for paying an export drawback of 4.50 marks ($1.07) a ton on finished products.

From the finished branches there is little news that gives encouragement. Only steel rails remain in a satisfactory position, but Belgian mills are sharply competing for foreign orders in grooved and light rails. There has been more active buying of thin plates for export, but at low prices. In bars the situation is growing worse. Dealers are holding aloof, after having some weeks ago provided for their requirements. The fight of the two big groups in the tubing trade continues, and prices are still giving way.

The September shipments of the Steel Works Union (in semi-finished steel, rails, and structural shapes) amounted to 518,000 tons, or about 6500 tons less than in August, but 8000 tons more than in September, 1912. The movement in semi-finished products was about 17,000 tons more than in August, but in steel rails about 19,000 tons less.

At the annual meeting of the Hasper Eisen und Stahlwerk, Director Klöckner, who is one of the best known men in the German iron trade, expressed the opinion that the reduction in the American tariff would probably give an opportunity for selling German iron products in the United States in 1914.

Belgian Prices Still Going Down

The Belgian market continues to send in news of falling prices. A dispatch from Brussels five days ago referred to growing lack of orders and increasing German competition as making it necessary to cut export prices again. The new prices are as follows: Thin plates, 110s. to 112s. ($26.76 to $27.25); heavy plates, 104s. ($25.30); basic steel bars, 89s. to 91s. ($21.66 to $22.15); iron bars, 94s. ($22.88), and bands, 122s. ($29.69). Three days ago another dispatch stated that sharper German competition rendered it necessary for the Belgian mills to reduce semi-finished steel 2s. (49c.) for export. The new prices are 74s. ($18.01) for ingots; 75s. to 77s. ($18.25 to $18.74) for billets, and 79s. ($19.22) for slabs. Another dispatch of yesterday mentioned the decreasing demand for pig iron and the growing difficulty in making sales. This led to further reductions in home prices to the following levels: Foundry, 75 to 76 francs ($14.48 to $14.67); Thomas iron, 65 to 66 francs ($12.55 to $12.74) if containing no manganese, and 68 to 69 francs ($13.12 to $13.32) if containing it, and puddling iron 65 to 66 francs ($12.55 to $12.74).

Buffalo

BUFFALO, N. Y., October 21, 1913.

Pig Iron.—Buying continues to be very light in volume and the market is lifeless and devoid of stimulating features. The total sales for the week aggregated only about 5000 tons, all grades. Such small inquiry as is coming in is principally for current needs, and buyers, as a rule, are still maintaining a waiting attitude with reference to their requirements beyond the first of the year. Prices are practically unchanged, producers holding firmly to the schedule as quoted below, for delivery over the fourth quarter f.o.b. furnace:

No. 1 foundry	$14.25 to $15.00
No. 2 X foundry	14.00 to 14.50
No. 2 plain	14.00
No. 3 foundry	13.75 to 14.00
Gray forge	13.75
Malleable	14.25 to 14.75
Basic	14.50 to 14.75
Charcoal, regular brands	15.50 to 16.50
Charcoal, special brands and analyses	17.00 to 19.50

Finished Iron and Steel.—The week has exhibited some symptoms of halting as regards placing new business in bars. Practically everything bought is for urgent shipment. This applies to structural material as well and the encouraging feature is that it indicates that stocks on hand are small. Manufacturers and jobbers are apparently holding down stocks as a protection against possible price changes. There has been quite active specification against contracts for wire nails and wire products. In the Canadian trade fabricators are feeling quite optimistic regarding the future, partly because of the tremendous public works improvements of municipalities and the government. One award made was for a new Customs House at Ottawa involving 2500 tons of structural steel. The Collingwood Shipbuilding Company is to build a lake freighter requiring 2500 tons of plates and shapes. In this district business for the fabricators continues to be of moderately good volume. Bids have been taken for an extension of the Hertel avenue car house, International Railway Company, requiring 100 tons and bids will be received next week for a club house for the Order of the Orioles, 150 tons. The Buffalo Structural Steel Company was low bidder for the new printing plant of the J. W. Clement Company, Buffalo, 278 tons. Contract for steel for the dye house to be built by S. Sanford & Sons, Inc., Amsterdam, N. Y., about 400 tons, has been let to the Carnegie Steel Company, Pittsburgh.

Old Material.—The market is dormant. The principal user of scrap here is entirely out of the market for the present. What scrap is being moved is going into the Pittsburgh and Valley districts. There is a demand from Pittsburgh and vicinity for a number of the commodities on the old material list, but consumers there are not inclined to pay the prices which have been asked and some sales have been made at reduced prices. This affects heavy melting steel slightly and some other lines quite materially, particularly boiler plate, bundled sheet scrap, cast scrap, No. 1 railroad wrought, turnings and borings and wrought pipe; and the price schedule has been revised to a lower level in these cases. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	$10.25 to $10.75
Boiler plate sheared	12.00 to 12.50
Bundled sheet scrap	7.00 to 7.50
No. 1 busheling scrap	10.00 to 10.50
No. 2 busheling scrap	7.50 to 8.00
Low phosphorus steel scrap	16.50 to 17.00
Iron rails	15.00 to 15.50
No. 1 railroad wrought	12.50 to 13.00
No. 1 railroad and machinery cast scrap	12.00 to 12.50
Steel axles	17.00 to 17.50
Iron axles	22.50 to 23.00
Carwheels	12.00 to 12.50
Railroad malleable	11.50 to 12.00
Locomotive grate bars	9.50 to 10.00
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	8.50 to 9.00
Machine shop turnings	5.75 to 6.25
Heavy steel axle turnings	8.00 to 8.75
Clean cast borings	5.75 to 6.25
Bundled tin scrap	14.00

Boston

BOSTON, MASS., October 21, 1913.

Old Material.—Dealers have lowered their prices again, believing that a further readjustment is necessary. Business continues exceedingly quiet. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices.

Heavy melting steel	$8.25 to $8.50
Low phosphorus steel	13.75 to 14.75
Old steel axles	13.75 to 14.75
Old iron axles	21.25 to 21.75
Mixed shafting	13.25 to 13.50
No. 1 wrought and soft steel	10.00 to 10.25
Skeleton (bundled)	6.50 to 7.00
Wrought-iron pipe	8.00 to 8.25
Cotton ties (bundled)	7.00 to 7.25
No. 2 light	3.75 to 4.25
Wrought turnings	4.50 to 5.00
Cast borings	5.00 to 5.25
Machinery, cast	11.25 to 11.50
Malleable	8.00 to 8.25
Stove plate	7.75 to 8.00
Grate bars	6.25 to 6.50
Cast-iron carwheels	12.00 to 12.25

New York

NEW YORK, October 22, 1913.

Pig Iron.—The story of the local pig iron market for the past week is quickly told. Orders have dried up. The greatest concern of melters is to get the iron they have under contract. Seldom has there been such urgency for shipments when there was so little new buying as at present. The situation is not that consumption of foundry iron has fallen off to any great extent; it is rather that foundrymen are busy enough to take all the iron that is coming to them and apparently have very small stocks on hand. A 500-ton sale for November and December delivery is the largest reported locally for foundry consumption. Foundrymen who attended the Chicago convention apparently did not find anything in the consensus of opinion there to lead them to buy for 1914 delivery. It is therefore simply a waiting market; but if foundry operations continue on the present scale the wait is not likely to last a great many weeks. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, $16 to $16.25; No. 2 X, $15.75 to $16; No. 2 plain, $15.50 to $15.75. Southern iron is quoted at $15.75 to $16.25 for No. 1 foundry and $15.25 to $15.75 for No. 2.

Finished Iron and Steel.—Steel bars are still conspicuous for their strength, notwithstanding repeated efforts to create impressions of occasional price shading. In structural shapes and plates the reverse is true, and the condition is accounted for in part through the greater number of makers of these products, which fact does not, as in the case with bars, leave the basis of distribution in strong hands. Admissions are freely made that plates and shapes can both be bought at 1.30c. base, Pittsburgh, although the amount actually so moving must be very small, so difficult is it to get direct evidence. Most of the shading is to develop round prices at points of delivery with the result that the prices figured back to the mills are slightly below the common Pittsburgh quotation. In line with the decided dullness quite a slump in demand is noted in bar iron, and so little has been sold at the higher levels

that this week's quotations show a narrowing in range. There is perhaps a little more evidence that agents for foreign makers are studying the needs of American consumers, but there is hardly enough activity in this direction to count as indications of future aggressiveness. One case is learned of, however, of foreign bars being offered at 1.23c. at dock in Boston, duty paid. While fabricated steel for building work in this section has not brightened, it is encouraging to note that subway contracts aggregating $80,000,000 are scheduled to be let before January 1. Some 3000 tons of this for Seventh avenue, south of Thirtieth street, are to be bid for November 10. There is a fair aggregate likely to be closed in a few days and 8000 tons involved in a few of the larger sized jobs have been settled since the last report, including 1150 tons for the New Jersey Zinc Company, Palmerton, Pa., to the American Bridge Company; 1500 tons for a highway bridge at Brownsville, Pa., reported taken by the Fort Pitt Bridge Works; 250 tons for a bank for the Marcus Holding Company, Delancey street, New York, to Ravitch Brothers; 1350 tons for the Lehigh Valley at Buffalo, to the Lackawanna Bridge Company, and the following to the Levering & Garrigues Company; 2200 tons, New York Telephone Company, Albany, N. Y.; 700 tons for the Aetna Insurance Building, Hartford, and 200 tons for the New York Central. The New York Central has another inquiry for 250 tons for canopies and bids are to be taken November 1 for a coaling station, Pearl Harbor, Hawaii, involving 2000 tons, and it is understood that the Pennsylvania is to build a 355-ft. span, requiring 750 tons, over the Erie Railroad. We quote mill shipments of plain material and plates at 1.35c. to 1.40c., Pittsburgh, or 1.51c. to 1.56c., New York, though on desirable orders the lower price is shaded as much as $1 a ton. Steel bars are: 1.40c., Pittsburgh, or 1.56c., New York, and bar iron 1.35c. to 1.45c., New York. Store prices range from 1.95c. to 2.05c. for steel bars and 2c. to 2.10c. for iron bars and steel plates and shapes.

Ferroalloys.—Inquiries for 80 per cent. ferromanganese are very few, and sales for the past week have amounted to not more than 300 to 400 tons. Most of these have been made at the producers' quotation of $50, Baltimore, though it is understood that some sales have been made of German ferromanganese at $49 to $49.50, Baltimore. The market for ferrosilicon is quiet, and the quotations are $75, Pittsburgh, for carloads; $74 for 100 tons and $73 for 600 tons and over.

Cast-Iron Pipe.—R. D. Wood & Co. were the low bidders on 6483 tons of pipe on which bids were opened by Atlantic City, N. J., October 16. Their price was $20.59, delivered, on the pipe, and $55 on 80 tons of specials. The next lowest bidder was the United States Cast Iron Pipe & Foundry Company, whose figures were $20.95 on the pipe and $54 on the specials. The inquiries from private buyers have subsided to a considerable extent, and no business has resulted from those who have been feeling the market for spring delivery. Carload lots of 6 in. are quoted at $23 to $23.50 per net ton, tidewater, New York.

Old Material.—Consumers of heavy melting steel scrap appear to be completely out of the market, as strenuous efforts by dealers are reported to have resulted in no sales. Foundries have lately been better buyers of old material than other branches of the consuming trade. Old car wheels seem to be in no demand whatever. Borings and turnings are in large supply, but are apparently not wanted by consumers at present. The situation is extremely discouraging to holders, and still lower prices are looked for. Dealers' quotations are about as follows per gross ton, New York:

Old girder and T rails for melting	$8.50 to $9.00
Heavy melting steel scrap	8.50 to 9.00
Relaying rails	21.00 to 21.50
Rerolling rails	11.50 to 12.00
Iron car axles	21.00 to 22.00
Steel car axles	15.00 to 16.00
No. 1 railroad wrought	11.25 to 11.75
Wrought iron track scrap	10.50 to 11.00
No. 1 yard wrought, long	10.00 to 10.50
No. 1 yard wrought, short	9.00 to 9.50
Light iron	3.50 to 4.00
Cast borings	4.50 to 5.00
Wrought turnings	4.50 to 5.00
Wrought pipe	8.00 to 8.50
Car wheels	11.00 to 11.50
No. 1 heavy cast, broken up	11.00 to 11.50
Stove plate	8.50 to 9.00
Locomotive grate bars	7.50 to 8.00
Malleable cast	8.50 to 9.00

John Leonard & Co., Inc., New York, were the successful bidders on 2000 tons of heavy steel gun turnings and 500 tons of heavy steel scrap, representing accumulations at the Washington Navy Yard; also on 4000 tons of Corliss engines, generators, etc., and a large quantity of copper at Weehawken, N. J., offered for sale by Henry L. Doherty & Co., bankers. M. J. & M. Blake, Inc., New York, were the successful bidders on 1000 tons of old machinery and other material sold by the finance department of the New York City comptroller's office.

Metal Market

NEW YORK, October 22, 1913.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York.			Lead		Spelter	
Oct.	Lake.	Electrolytic.	Tin, New York.	New York.	St. Louis.	New York.	St. Louis.
16	16.75	16.40	40.80	4.35	4.20	5.30	5.15
17	16.87½	16.45	40.40	4.35	4.20	5.30	5.15
18	17.00	16.50	40.25	4.35	4.20	5.30	5.15
20	17.00	16.62½	40.25	4.35	4.20	5.35	5.20
21	17.00	16.75	40.12½	4.35	4.20	5.35	5.20
22	17.00	16.75	40.35	4.35	4.20	5.35	5.20

Copper prices continue nominal, but are higher in sympathy with Standard abroad. Tin shows but litle variation and the market is quiet. Lead is lower and business in small lots a trifle better. Spelter has an improved tone, but business is slow. Antimony is quiet at unchanged prices.

New York

Copper.—The entire market has a better tone with quotations several points higher, all of which was brought about through the rapid rise of Standard in London and indirectly through the closing of the Rio Tinto mine in Spain because of strike troubles. Despite the greater strength consumers have shown no inclination to buy at any time in the week and prices are entirely nominal. The lots which have been offered by second hands for some weeks are still available, but these, too, have been affected by London and cannot be had at the low prices heretofore quoted. Efforts to place prompt metal have been unsuccessful, which shows that buyers are plentifully supplied for the present. They are not covered for December, however, and buying cannot be long delayed. The question which now arises is whether they will increase their stocks in a conservative manner or enter the market with a rush as they have done so often in times past. It is considered more likely that they will buy cautiously. Lake copper is quoted to-day at 17c. cash and electrolytic at 16.75c. Some high grade Lake was sold October 17 at 17.25c., cash. The London quotations to-day were £74 5s. for spot and £73 17s. 6d. for futures. Exports this month total 17,024 tons.

Pig Tin.—More interest has been shown by consumers, but the market on the whole has been quiet. On Monday and Tuesday there was some demand, but in the entire week, including these days, it is estimated that not more than 250 tons was purchased. The feature of the week, aside from the lack of demand, has been the desire on the part of speculative holders to get out of the market, which has brought prices down almost to the London level. It is expected that the October consumption will be small, some estimates placing it as low as 3000 tons. If these expectations are realized a big stock will be on hand November 1. It is conceded that consumption is falling off. The quotation in New York to-day is 40.35c. London quotations are £184 15c. for spot and £185 5s. for futures. The arrivals this month total 2100 tons, and there is afloat 3085 tons.

Lead.—The American Smelting & Refining Company on October 16 reduced its price 10 points, to 4.35c., New York. Outside producers immediately followed and went to 4.20c., St. Louis, at which figure they can compete with the large interest in New York and undersell in other sections of the country. The decline has not steadied the market and the offerings show that the supply is greater than required by present demand. Small consumers have been more active in taking one and two carload lots, but these were not enough to steady the metal. Some talk has been heard of 4.25c., New York, as a possible price, but students of the market declare that any such figure would mean an undesirable situation. If it should come about, they say there would be danger of London coming into this market and buying heavily of domestic lead, thereby unsettling the market, causing a shortage and resultant higher prices to the detriment of American consumers. The price in London to-day is £20 7s. 6d. per ton, which is 4.45c. per lb. The discount of 2½ per cent. which London allows in sales of lead brings the

price down about 10 points, or to 4.35c., London. With 15 points allowed for freight, London could come into this market and pay 4.20c. Therefore, it is argued 4.25c., New York, would be near the danger point inasmuch as it would allow little room for decline. London is not well supplied with the metal.

Spelter.—While buying has not improved in any appreciable degree, the market has a little more strength. Quotations are 5.35c., New York, and 5.20c., St. Louis, which is five points higher than was quoted last week. The course of the metal in the near future depends to a great extent on the demand which is awaited from the galvanizers of plates. Foreign spelter at the present time can be laid down in New York at about 5.70c.

Antimony.—The market is quiet and unchanged at 7.12½c. to 7.25c. for Hallett's, 7.50c. to 7.62½c. for Cookson's, and 6.37½c. to 6.75c. for Chinese and Hungarian grades. There will not be much activity until the large supply on hand is absorbed, but this, according to some dealers, will be much sooner than is generally expected.

Old Metals.—The market continues dull. Dealers' selling prices remain unchanged as follows:

	Cents per lb.
Copper, heavy and crucible	15.50 to 15.75
Copper, heavy and wire	15.00 to 15.25
Copper, light and bottoms	13.25 to 13.50
Brass, heavy	9.75 to 10.00
Brass, light	8.25 to 8.50
Heavy machine composition	13.50 to 13.75
Clean brass turnings	9.00 to 9.25
Composition turnings	11.75 to 12.25
Lead, heavy	4.25
Lead, tea	4.00
Zinc, scrap	4.37½

Chicago

OCTOBER 20.—It is reported that stocks of Lake copper in the Upper Peninsula have been reduced to about 1,000,000 lb. and the market for this metal is accordingly very firm and restricted. Lead prices have been reduced again; quotations for zinc are 25c. lower and the quotations for spelter have again been lowered. We quote as follows: Casting copper 16.75c.; Lake copper, 17c. to 17.25c., for prompt shipment; small lots ¼c. to ⅛c. higher; pig tin, carloads, 41.50c.; small lots, 43.50c.; lead, desilverized, 4.30c. to 4.35c. and corroding, 4.55c. to 4.60c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.25c.; Cookson's antimony, 9.50c.; other grades, 8c.; sheet zinc, $7.50 f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600 lb. sacks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 14c.; copper bottoms, 12.50c.; copper clips, 13.25c.; red brass, 12.50c.; yellow brass, 9c.; lead pipe, 3.75c.; zinc, 3.75c.; pewter, No. 1, 26c.; tin foil, 32.50c.; block tin pipe, 33c.

St. Louis

OCTOBER 20.—The trend of the metal market has been steadily downward, lead especially being accelerated by a drop in one day of $3 per ton. Lead is now quoted at 4.20c. bid and 4.25c. asked; spelter, 5.15c. bid and 5.20c. asked; Lake copper, 17.22½c. to 17.35c.; electrolytic copper, 17.10c. to 17.22½c.; tin, 40.60c. to 41.10c.; Cookson's antimony, 7.95c. In the Joplin zinc ore market there was a reduction of about $1 per ton, the basis range for 60 per cent. being $39 to $43 per ton, with top settlements for premium ore at $46. A number of sheet ground mines have suspended operations pending an improvement in prices. Calamine sold on a range of $21 to $22 for 40 per cent., with premium settlements as high as $26. Lead ore was weak and $2 off, selling at $52 for 80 per cent. Miscellaneous scrap metals we quote as follows, f.o.b. St. Louis: Light brass, 5.50c.; heavy brass and light copper, 10c.; heavy copper and copper wire, 11.50c.; pewter, 24c.; tinfoil, 30c.; zinc, 2.75c.; tea lead, 2.75c.; lead, 3c.

The regular monthly meeting of the Engineers' Society of Western Pennsylvania was held in Pittsburgh, October 21. H. C. Siebert, steam engineer, and Charles Fitzgerald, Jr., assistant steam engineer at the Duquesne works of the Carnegie Steel Company, read papers on "The Measurement and Calculations of the Power Required to Roll Steel." The society is making plans to entertain members of the Cleveland Engineering Society in Pittsburgh on Saturday, November 1. Visits will probably be made to several notable plants in Pittsburgh, and a dinner will likely follow in the evening. The members of the Pittsburgh society paid a visit to Cleveland last spring.

Iron and Industrial Stocks

NEW YORK, October 22, 1913.

The stock market underwent a period of decided weakness on Thursday and Friday of the past week, ascribed to disquieting rumors regarding the Rock Island Railroad, coupled with reports of increasing activity by the Government in the prosecution of large corporations. These influences had only a temporary effect and quite a rally followed on Monday and Tuesday of this week, stimulated by the decision of the Interstate Commerce Commission to permit an advance in some Western freight rates. Some stocks, notably the United States Steel stocks, recovered more than the ground lost during the depressed period. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Am. Can, com.	29¼- 32⅜	Railway Spring, pref.	93 - 94
Am. Can, pref.	88¼- 93	Republic, com.	18⅝- 20
Am. Car & Fdy., com.	41¼- 44⅞	Republic, pref.	77½- 81
Am. Car & Fdy., pref.	114	Rumely Co., com.	20 - 20⅛
Am. Loco., com.	29¾- 31⅛	Rumely Co., pref.	48
Am. Loco., pref.	95 - 98	Sloss, com.	28
Am. Steel Foundries.	26	Pipe, com.	10 - 10½
Bald. Loco., com.	40 - 40½	Pipe, pref.	59¾- 60⅜
Beth. Steel, com.	28¾- 30⅞	U. S. Steel, com.	53¼- 59
Beth. Steel, pref.	70	U. S. Steel, pref.	104⅞-107
Colorado Fuel	27 - 29	Va. I. C. & Coke.	40 - 41
General Electric	139 -141	Westinghouse Elec.	63½- 66
Gr. N. Ore Cert.	30½- 34¼	Am. Ship, com.	33
Int. Harv., com.	101⅝-104	Chic. Pneu. Tool.	52
Int. Harv., pref.	115	Cambria Steel	47⅞- 49½
Int. Harv., Corp.	102 -104	Lake Sup. Corp.	23 - 23¾
Int. Pump, pref.	24	Pa. Steel, pref.	66 - 67
Nat. En. & St., com.	9¾- 10½	Warwick	10½- 10⅝
Nat. En. & St., pref.	74¼	Crucible Steel, com.	15½- 16⅝
Pressed Steel, com.	23¾- 24½	Crucible Steel, pref.	86 - 89¼
Pressed Steel, pref.	96 - 98	La Belle Iron, com.	41¾
Railway Spring, com.	23¾- 25		

Dividends Declared

The Crocker-Wheeler Company, quarterly, 1½ per cent. on the common stock and regular quarterly, 1¾ per cent. on the preferred stock, payable October 15.

The Cambria Steel Company, regular quarterly, 1¼ per cent., payable November 15.

The National Lead Company, regular quarterly, 1¾ per cent. on the preferred stock, payable December 15.

The Canadian Car & Foundry Company, regular quarterly, 2 per cent. on the common stock, payable December 1.

The Dominion Steel Corporation, regular quarterly, 1½ per cent. on the preferred stock, payable November 1.

The Great Northern Ore Properties, 50 cents per share, payable November 25. The last previous dividend declaration was made in December, 1912, and was for the same amount.

The D. H. Stoll Company has been incorporated to take over the press, shear, die and special metal-working mechanical procedure and thus leave his time free for Stoll at Military road and Lansing street, Buffalo, N. Y Daniel H. Stoll is president; Roy J. MacKenzie vice-president, and Kenneth B. MacDonald secretary and treasurer. Messrs. MacKenzie and MacDonald were formerly associated with the E. R. Thomas Motor Company as purchasing agent and factory manager respectively

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Operations at the new plant of the Wheeling Sheet & Tin Plate Company, at Yorkville, six miles above Martins Ferry, Ohio, will be started in four weeks, with a full force of 700 men, according to announcements by officials of the company. The machinery has been installed and is being tested. Orders are now being solicited and many are being booked. It is estimated three times as many applications for work have been received as there are positions to fill.

The Northwestern Malleable Iron Company, Milwaukee, Wis., has increased its capital stock from $150,000 to $500,000. The additional issue will be distributed among the present stockholders to reduce the large surplus the company has accumulated. No extensions are in prospect in the immediate future. Frederick L. Sivyer is president.

The J. E. Moss Iron Works, Wheeling, W. Va., announces the removal of its works and general offices to Twenty-eighth and Chapline streets. At its new location it has greatly enlarged facilities for taking care of its increased business.

Electric Steel for Small Castings*

Data as to Costs Comparing Fuel-Heated Furnaces with Electric

BY F. T. SNYDER

The following is a short statement of the present situation regarding the electric melting of steel for small castings. It refers entirely to the practice of melting cold steel scrap with electricity, as developed in commercial use in American jobbing foundries. Such foundries usually pour less than ten tons of steel per day. The electric refining of steel previously converted in fuel furnaces for structural and tool purposes is not considered here.

Electric steel castings have been on the American market from a number of jobbing foundries for several years, and this use of electric furnaces for melting steel for small castings is rapidly spreading. The growth is due principally to the fact that steel in small quantities can, under usual conditions, be poured at a decidedly lower total cost from an electric furnace than from fuel-heated furnaces.

A secondary reason for the growth of the practice is that the present quality of electric steel castings is somewhat better than the quality poured from fuel-melted steel. This improvement in quality does not as yet command an increased price, but operates to attract business to the foundries using electric furnaces. In the Middle West the electric steel foundries ran to capacity through the months of this last spring when many crucible and converter plants were running on part time. It is practical with electric melting at a small increase of the usual melting cost to produce castings decidedly better in quality than those now on the market as soon as the demand for such extra quality exists.

The improvement in quality of electric castings is primarily in the increased resistance to suddenly applied loads, making it permissible to use castings for parts subject to shock, such as auto truck brackets, where converter and crucible castings have proven unreliable. The quality increase in this direction is large, electric castings standing two and three times the number of drop hammer blows required to break fuel-melted steel of the same carbon content from the same pattern. The tensile strength of electric steel is 5000 to 10,000 lb. higher than the fuel-melted steels for the same carbon. This is in part due to the higher specific gravity of the electric steel which in turn comes from the smaller volume of microscopic blow-holes.

The cost of electric melting is lower than crucible melting principally because the electricity costs less than the crucibles, so that the competitive cost of fuel is immaterial. The cost of electric melting is lower than side blow converter practice because the steel scrap melted in the electric furnace costs so much less than the high silicon pig iron required for the converter that the difference more than pays for the electricity. The labor and refractory costs for both crucible furnace and converter are considerably higher than with an efficient electric furnace. The tonnage of the usual small casting steel foundry is so small that a small open-hearth furnace can operate only part of the day with resulting labor and refractory costs that are higher than for the same tonnage from a well-designed electric furnace.

Cost of Electric Steel in Middle West

Table 1 gives the general costs of electric steel in the Middle West for the usual range of tonnages for 24-hr. and 12-hr. operations. Owing to the general practice of charging for electric power on a system of a primary demand charge per kilowatt plus a secondary consumption charge per kilowatt hour, the cost of electricity per unit is much less for 24-hr. operation than for 12-hr. operation. A furnace loses heat during the night with 12-hr. operation, which has to be put in again when the furnace starts up in the morning. These two items make the cost of 24-hr. continuous electric melting decidedly lower than for 12-hr. operation. This table refers to the operation of a specific type of furnace of high average efficiency. The cost in Table 1 is based on the following charges:

Labor—		
Melter	$5.00	per day
Assistant melter	4.00	per day
Helper	3.00	per day
Laborer	2.00	per day
Electricity, off peak, primary charge—	Basis	
First 100 kw.	15.00	per year
Remainder	9.00	per year
Secondary charge	7/10c.	per kw. hr.
Stock—		
Punchings	11.00	per 2000 lb.
Heads and gates	8.00	per 2000 lb.
Pig iron	12.00	per 2000 lb.
Alloys—		
Ferrosilicon	40.00	
Ferromanganese	50.00	

Interest, depreciation, supervision and overhead are not included as they are about the same as for fuel-heated furnaces and differ widely from one foundry to another.

Table 1—Electric Steel Melting—Costs per ton melted

Middle West conditions; public service electricity

Hours run per day..	12	12	12	24	24	24
Tons melted per day	4	8	12	5	10	20
Labor	$2.50	$1.25	$0.84	$2.80	$1.40	$0.70
Electricity	10.20	8.01	7.58	7.20	6.39	5.32
Supplies	1.94	1.17	.95	2.20	1.41	.38
Conversion cost	14.64	10.43	9.37	12.20	9.10	6.90
Scrap	10.90	10.90	10.90	10.90	10.90	10.90
Ferroalloys	.60	.60	.60	.50	.50	.50
Melted metal cost....	$26.14	$21.93	$20.87	$23.60	$20.50	$18.30

Foundry Details

The use of electric steel reacts to some extent upon the foundry practice. The electric steel can readily be made very hot, so that extremely thin sections can be poured if desired. Anything that can be poured in gray iron will run with this hot steel. Owing to the neutral chemical condition of properly made electric steel, it is quieter and less precautions have to be taken against blow-holes from metal causes. The shrinkage is greater than with crucible or converter steel. More allowance has to be made on some patterns for machining. Owing to fluidity gates and heads can be made somewhat smaller.

Electric melting supplies a ready way of making alloy steels. The alloy can be added in the furnace. The electrical action causes sufficient movement of the steel to thoroughly mix the alloy. It has been found practical to remelt the heads and gates from alloy castings with practically no loss of alloy contents. With manganese steel this represents a substantial saving in cost.

It is to be noted that the development in this electric steel melting for small foundries is in melting cold steel scrap rather than in using melted iron from a cupola. The principal reason for this is a matter of cost. It is usually cheaper to melt cold steel scrap than to use melted pig iron, as shown by Table 2. Melted cast iron contains 265 kw. hr. of electric heat per ton. Against this apparent saving there are certain items of additional expense, which considerably more than offset the saving. Pig iron costs more than the steel scrap that an electric furnace can use. There is a higher metal loss. The pig iron that is commercially available is relatively high in phosphorus and sulphur, and the time required for refining out these impurities adds to the cost. To reduce the carbon within a reasonable time from pig iron values to the usual limits for steel castings requires the addition of iron oxide, usually iron ore. This leaves an oxidizing slag and requires a more skilled melter to pour quiet steel from melted cast iron, than from cold melted steel scrap. If this extra time and skill is not given when using melted cast iron, the loss of casting will be high. When melting cold steel scrap the loss of casting can be made lower than with any form of fuel melting.

The secondary reason for not using melted cast iron for electric steel, which is not important at present, but promises to be commercially important when the demand arises for better grade castings, is that the less hot nitrogen that comes in contact with hot steel the better the quality of the steel appears to be. The cupola blast is four-fifths nitrogen.

Table 2—Melted Cast Iron vs. Cold Steel Scrap

5 tons per 12 hrs.

Cost of cupola melting			$0.80
Extra electric furnace time—			
Labor	$0.90		
Electricity	2.55		
Supplies	1.00		
		4.45	
Stock—			
Pig iron, 2150 lb. at $13	$13.97		
Steel scrap, 2050 lb. at $11	11.20		
		2.69	
			$7.94
Saving in electric power with melted cast iron, 265 kw. hr. at 1¼c.			3.32
Extra cost, melted cast iron over cold steel scrap			$4.62

*A paper read at the convention of the American Foundrymen's Association, Chicago, October 14 to 17.

Crucible Steel Company of America

Annual Report for the Fiscal Year Ended August 31, 1913

The thirteenth annual report of the Crucible Steel Company of America, Pittsburgh, and its subsidiary companies, presents the following statement of earnings by quarters:

First quarter, ended November 30, 1912	$1,795,121.09
Second quarter, ended February 28, 1913	2,001,938.82
Third quarter, ended May 31, 1913	1,641,873.47
Fourth quarter, ended August 31, 1913	1,519,197.12
Total gross earnings	$6,958,130.50

From this amount charges and depreciation were deducted as follows:

Repairs	$1,033,163.54	
Depreciation	665,000.00	
Contingencies	53,595.36	
Interest on scrip and bonds of subsidiary companies	300,485.81	
		2,052,244.71
Net profits applicable to dividends		$4,905,885.79

The undivided surplus, represented by quick assets derived entirely from operating profits, after the payment of the preferred dividend of 7 per cent. per annum ($1,750,000), is $8,106,162.54, as compared with $4,950,276.75 in the preceding year, showing an increase of $3,155,885.79 for the current year.

This showing indicates the most prosperous year in the company's history, and is the more remarkable since two of the largest plants were shut down almost three months of the fiscal year because of labor troubles.

From the accompanying statement, signed by Chairman Herbert Du Puy and President C. C. Ramsey, the following extracts are taken:

"The item of repairs may seem large, but when is considered the saving instituted through bringing the plants up to a modern standard, it is surely money well spent. As an example of what can be accomplished in one direction only, it is but necessary to refer to a change at the Park works. To do away with the smoke evil, to save labor and make the fuel consumption there the more effective, we have endeavored to put into use such mechanical devices as will produce the best steam economies. Here we have scrapped an old plant of 55 boilers, located on valuable land leased by the company for many years, in which boilers the insurance companies would allow a pressure of but 85 lb., and have replaced them with eight 600-hp units, having double steam pressure, and with mechanical stokers. These eight boilers cost, with boilerhouse, coal and ash handling apparatus, including every mechanism known to produce an up-to-date plant, but $130,000. This new installation is saving $1500 per month in pay roll and $3500 per month in coal, equal to $60,000 per annum, or 6 per cent. on $1,000,000. In addition, new boilers have increased the capacity of the whole mill through a greater steam supply. As they occupy an area of but 4500 sq. ft., the company has been able to relinquish the lease on 40,000 sq. ft. of very valuable land, making an additional considerable saving. It is safe, therefore, to say that through this expenditure of $130,000 the company will save more than half of the cost each year, or, in other words, the full amount will be liquidated in two years. A somewhat similar installation is now being erected at the Crescent plant, and, as opportunity offers, your other plants will be improved in the same manner.

"Since our last report, the machinery from the Aliquippa plant has been removed to other plants and the real estate and buildings have been sold. It had not been in operation for several years because of the inability to manufacture its products there as cheaply as they can be produced at some of the company's Pittsburgh plants.

"The plant of the Pittsburgh Crucible Steel Company has been steadily growing the past year through the gradual completion of the buildings and machinery originally contemplated. Owing to the continued demands upon some of the contractors in other directions, the work at Midland has not grown as rapidly as was expected, but it is gratifying to report that the open-hearth steel department began successful operations, upon a limited scale, on August 4, 1913, just two years after the contract was made for its construction. It is hoped that toward spring the completion of the finishing mills, now in course of erection, will follow.

"The growth of the Midland Improvement Company is shown through the continual construction of additional houses of various types for the use of the wage-earners of the Pittsburgh Crucible Steel Company. Lots have been sold, and new employees of the company, encouraged by the efforts of the management to improve building conditions, are following the types of houses originated by us, so that the recently acquired portion of Midland will soon partake of the appearance of a model town.

"The output of the mines of the Crucible Coal Company has been steadily increased so that it now supplies the entire requirements of two of our largest plants in the Pittsburgh district. The original fleet of 50 wooden coal-boats and a steamboat has been augmented through the addition of a fleet of 22 steel barges and an additional steamboat, each of the barges being capable of carrying 500 tons of coal. It is expected that this united fleet will take care of the entire fuel demands of all of the plants of the company adjacent to the Allegheny and Ohio rivers.

"Since the last report, the company has added to its original purchase of coal lands in Greene County, Pa., on the Monongahela River, 2500 additional acres, thus protecting its fuel requirements for many years, its entire holdings now amounting to some 4500 acres

"The completion of the improvements at the Atha works has not been as rapid as had been expected. Owing to delays in the construction of the turbine system, the electric furnace, forming a part of this plant, will hardly start operations before December. When completed, however, it is a satisfaction to know that through its operation great savings in the cost of some of the products of the Atha works must result.

"The construction of the new plant of the Syracuse Crucible Steel Company, as indicated in the last report, is now under way and is rapidly taking form. It is expected that the erection of the buildings will be completed by the spring of 1914, when the remainder of the year will be required to erect the necessary machinery to make the works the most up-to-date crucible steel producer in the world.

"During the year since our last annual report, a change in Congressional representatives has brought about a determination on the part of the majority to reduce import duties on most of the manufactures of this country, including the lines of steels produced by this company. Just what permanent effect such reductions will have upon the company's earnings it is too early to foresee, but we are fully prepared to meet such new conditions when they shall arise."

The Tariff Provisions on Ship Materials

Having had inquiries on the subject, we give below the paragraphs relating to free importations of materials for the construction and repair of vessels, as given in Section IV of the new tariff, approved October 3, 1913:

"J. Subsection 5. That all materials of foreign production which may be necessary for the construction of naval vessels or other vessels of the United States, vessels built in the United States for foreign account and ownership, or for the purpose of being employed in the foreign or domestic trade, and all such materials necessary for the building of their machinery, and all articles necessary for their outfit and equipment, may be imported in bond under such regulations as the Secretary of the Treasury may prescribe; and upon proof that such materials have been used for such purposes no duties shall be paid thereon.

"J. Subsection 6. That all articles of foreign production needed for the repair of naval vessels of, or other vessels owned or used by, the United States and vessels now or hereafter registered under the laws of the United States may be withdrawn from bonded warehouses free of duty, under such regulations as the Secretary of the Treasury man prescribe."

The Pioneer furnace of the Cleveland-Cliffs Iron Company at Gladstone, Mich., was blown out October 10 and will be idle until early next summer. During this time the stack will be relined and the plant generally overhauled. The furnace was built 16 years ago, and during the last five years has been in continuous operation.

Personal

J. H. Plummer, president of the Dominion Steel Corporation, recently sailed for England on business connected with the further financing of that company.

Charles M. Schwab returned this week from a European trip made for the completion of transactions relating to the acquisition of the Tofo mines in Chile by the Bethlehem Steel Company. He is reported as stating that while abroad he had decided not to place proposed contracts for vessels to bring iron ore from Chile to the Bethlehem Steel Works, as conditions appeared to indicate the strong probability of securing much lower prices in the course of the next six months.

Albert Walton, who in the last 14 years has been connected with the United States Steel Corporation, Fairbanks, Morse & Co., and others as manufacturing accountant and factory economist, has opened an office in the Franklin Building, Philadelphia, Pa., to engage in consulting practice in his specialty.

R. Huyck, vice-president National Transit Company, Oil City, Pa., has succeeded A. P. Steen, resigned, as managing director of the shops at the Oil City plant.

Fred E. Moore has been elected secretary and treasurer of the Coatesville Boiler Works, Coatesville, Pa., which position was recently made vacant by the death of his brother, Edwin T. He will continue to hold the position of purchasing agent. Nelson H. Genung, vice-president of the company, has also been made general manager, a position rendered vacant by the death of Edwin T. Moore.

D'Arcy W. Roper, formerly secretary and general manager of the Great Lakes Construction Company, Buffalo, has taken the position of sales manager for the Buffalo Car Wheel Foundry Company, with offices at 84 Dun Building, Buffalo.

F. B. Cooley has severed his connection with the Buffalo Car Wheel Foundry Company, having secured a controlling interest in the New York Car Wheel Company, of which he is now president.

John Sargeant, president Domhoff-Joyce Company, Cincinnati, has returned from an automobile vacation trip through the South.

J. S. Fraser, superintendent of blast furnaces for the Carnegie Steel Company, Clairton works, has resigned to accept a similar position in charge of furnaces for the Pittsburgh Steel Company, Monessen plant.

D. de Vries, who is prominently identified with the machine tool industry in Holland, being manager of the technical department of R. S. Stokvis & Zonen, Ltd., Rotterdam, is making a two months' tour through the United States. He was among the visitors at the foundry exhibit at Chicago last week.

W. M. McFate, who has been advertising manager of the Trumbull Steel Company, Warren, Ohio, has been elected assistant secretary and treasurer of that company.

John Fulton, Johnstown, Pa., who was for many years connected with the Cambria Iron Company, now the Cambria Steel Company, and from 1887 to 1897 was general manager, celebrated his 87th birthday recently. He retired a number of years ago and is now writing his memoirs. Prior to his connection with the Cambria Company Mr. Fulton was a prominent figure in the development of the coal mining industry of the Cambria-Somerset field. In recent years he conducted a series of very valuable coking tests.

Eugene Gardner, who has been connected with the Chicago sales office of the Warner & Swasey Company, Cleveland, Ohio, has been transferred to the New York office to assist Charles J. Stillwell, New York manager. Mr. Gardner will give his attention principally to New York and adjacent territory, Mr. Stillwell looking after the outlying territory for which the office is responsible.

James M. Motley, 71 Beaver street, New York, announces that he now represents the export departments of the following companies: Glover Machine Works, Marietta, Ga.; Youngstown Car & Mfg. Company, Youngstown, Ohio; Southern Car Company, High Point, N. C.; Weir Frog Company, Cincinnati, Ohio; American Casting Company, Birmingham, Ala., and Garfield Fire Clay Company, Robinson, Pa.

Obituary

JAMES MILLS, president Smith & Mills Company, Cincinnati, Ohio, died at his home in that city October 17, aged 74 years. Although he had been ill with heart trouble for over six months, his death was unexpected. Mr. Mills was born in Oldham, England, and came to this country in 1861, settling in New York. He served in the civil war and afterward resided in Savannah, Ga., for a time, removing to Cincinnati in 1868. Becoming connected with the John Steptoe Machine Tool Company, he was shortly afterward appointed superintendent of the plant. In 1888 he and Albert S. Smith organized the company of which he was president at the time of his death. He acquired a reputation as an expert in both the designing and manufacturing of machine tools, and was well known in machine circles all over the world. He leaves a widow, two sons and three daughters.

WILLIAM A. JOHNSON, general sales agent for the Jamison Coal & Coke Company, Oliver Building, Pittsburgh, died at his home in that city October 16, of pneumonia, after a short illness, aged 39 years. He was born in a small town near Charlotte, N. C. His first business connection was with the Southern Railway Company in Charlotte, and later he was transferred to the purchasing department of the same road in New York City. In 1902 he was appointed private secretary to Archer Brown, of Rogers, Brown & Co., in New York City, and was then transferred to its Chicago office, taking a position in the selling department. In 1904 he was again transferred to Pittsburgh, to take charge of the coke business of the firm, and in August, 1905, was appointed general sales agent of the Jamison Coal & Coke Company, succeeding O. M. Hartzell. He leaves a widow and four children.

WILLIAM MEDART, of the Medart Patent Pulley Company, St. Louis, Mo., died October 9, after a brief illness. The company is a copartnership formed by Philip and William Medart in October, 1879, to manufacture the Medart steel rim pulley, of which Philip was the patentee. They added shafting, hangers, friction clutches, rope drives, gearing, etc., until a complete line of power transmission material was acquired. In December, 1910, Philip died and his son, Walter R., succeeded him in the copartnership, assuming its active management. The death of William, therefore, will cause no change in the business policies.

GEORGE D. EVANS, formerly assistant manager of sales of the Cleveland, Ohio, office of the Republic Iron & Steel Company, but for the past three years connected with the Denver office of the Carnegie Steel Company, died suddenly in Butte, Mont., October 16, aged 34 years.

FRANK R. JONES, president Jones Iron Works, Buffalo, died at his residence in that city October 17.

Rapid Blast Furnace Relining.—The No. 3 blast furnace of the Algoma Steel Corporation, Sault Ste. Marie, Canada, was blown out for relining at 2.45 a.m., September 14, 1913. The top of the furnace was removed to be remodeled while the old lining was being taken out. The brick work was started at 9 a.m., September 21, and completed at 4 a.m., October 4. The time drying was 8½ days. The blast was put on at 2.35 p.m., October 15. The total time was 31 days 11 hours 50 minutes. The furnace had been in blast from April 15, 1911. It is 21 ft. 6 in. by 90 ft. and has a capacity of 450 tons a day.

J. D. Beck, member of the Wisconsin Industrial Commission, and C. W. Price, safety expert for the commission, were guests and the principal speakers at a "safety banquet" given by the J. I. Chase Threshing Machine Company, Racine, Wis., to 250 officials, department heads and assistants, to launch an educational campaign for safety and sanitation. The company long ago provided elaborate mechanical safeguards, but realizing that the problem of industrial safety is divided so that only a part of accident reduction is accomplished by mechanical means and a far larger part must come as the result of educational work, has organized a safety club among officials and employees to have charge of the campaign. More than 6000 men are employed by the company in Racine alone.

Pittsburgh and Valleys Business Notes

Recently revised freight rates on coke from the Connellsville regions to points east and west have been put in effect as follows: Pittsburgh, $0.75; Youngstown and Valley points, $1.20; Wheeling, $1.20; Cleveland, $1.65; Columbus, $1.65; Canton, $1.40; Toledo, $1.85; Detroit, $2.10; Milwaukee, $2.70; Chicago, $2.50; East St. Louis, $2.80; Buffalo, $1.85; Erie, $1.65; Harrisburg, $1.70; Baltimore, $1.80; Philadelphia, $2.05; New York, $2.85.

The McClintic-Marshall Construction Company, steel fabricator, with plants at Pittsburgh (Rankin), Carnegie and Pottstown, Pa., has changed its name to the McClintic-Marshall Company. It has placed a contract with the Pittsburgh office of the Snow Gas Engine Company, of Buffalo, N. Y., for a 400-hp. gas engine to be direct connected to an air compressor in the power plant of the Rankin works. It is a duplicate of an installation made by the same company about a year ago.

The Republic Iron & Steel Company, Youngstown, Ohio, is erecting a plant hospital for the benefit of the employees of its Brown-Bonnell works.

Edgar M. Moore & Co., Farmers' Bank Building, Pittsburgh, manufacturers' representatives, have opened a warehouse on the North Side, Pittsburgh, where they will carry in stock a line of machine tools, mine and mill supplies. They have recently been appointed representatives in the Pittsburgh district for the Monarch Valve Company, manufacturer of steam valves; Buffalo-Pitts Company, portable and traction locomotives and gas tractors; Niles Forge & Mfg. Company, light forgings; Bradford Motor Works, brass and aluminum castings.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has started work on a three-story office building, to be erected across the Mahoning River from its steel works and blast furnaces.

The report that the Mesta Machine Company, Pittsburgh, will build a plant in Canada is incorrect. It has simply arranged with a company at Bridgeburg, Ont., to manufacture for it some machinery on which the Mesta Machine Company owns Canadian patents, and which the Canadian patent laws require to be manufactured in Canada. The company has received an order from Corrigan, McKinney & Co., Cleveland, Ohio, for a 46 and 76 x 60 in. twin tandem compound reversing engine, which will be a duplicate of the one it furnished to the Youngstown Sheet & Tube Company, which has given excellent results. It has also recently received an order from the Bethlehem Steel Company for a complete 22-in. bar mill, including shears, tables, etc.; from the Imperial Steel Works of Japan for a No. 5 heavy type roll turning lathe, and from M. A. Hanna & Co. for putting new air ends on two blast furnace blowing engines, which will be equipped with the Mesta newly patented automatic valves.

The West Penn Steel Company, Brackenridge, Pa., states that the report it would make a very large shipment of sheets via the Panama Canal is exaggerated. Instructions have been received to send a sample carload of sheets via ocean and rail to a Pacific coast point of delivery, but it is purely experimental.

The Riter-Conley Mfg. Company, Pittsburgh, has received a contract from the Huasteca Petroleum Company, Los Angeles, for two standard 35,000 bbl. oil tanks, taking a total of 300 tons of steel, and a contract from the Penn-Mex Fuel Company, Pittsburgh, for two 55,000 bbl. oil tanks, also taking 300 tons, to be erected in the Panuca district, Tampico, Mexico.

The Independent Bridge Company, Pittsburgh, has received an order from the Government for the lock gates for the Dalles Cellilo Canal in the rapids of the Columbia River in Oregon. The contract consists of 11 pairs of gates, from 12 ft. to 51 ft. high. The gates will require about 1100 tons of structural steel, which will be furnished by the Carnegie Steel Company and the Jones & Laughlin Steel Company; 250 tons of cast steel, 75 tons of cast iron and 25 tons of forgings, besides bronze and babbitt metal. The contract price is $182,087, but some additional work has been ordered by the Government and the total will probably run up to about $225,000.

Boyts, Porter & Co., Connellsville, Pa., have received orders from the Greenwich Coal Company and the Mountain Coal Company for 10 electrically driven mine pumps of various styles and models, to be delivered in about 75 days. It has also received orders for and recently made shipments of mine pumps to the Youngwood & Ohio Coal Company, Crucible Coal Company, Bakewell Coal Company, Frick Coke Company and Standard Tin Plate Company.

On September 19 the creditors of the Kidd Brothers & Burgher Steel Wire Company, Aliquippa, Pa., appointed a committee to investigate the possibility and desirability of a reorganization of the company, but secured creditors, whose claims aggregate $28,250, secured by a pledge of $80,000 of second mortgage bonds, declined to approve the reorganization plan. In the opinion of the committee, this made it impracticable for a reorganization in the interest of the creditors to be effective, and the committee therefore considers itself discharged from further consideration of the matter.

W. J. Greer, manufacturers' agent, Empire Building, Pittsburgh, has been appointed representative in that city for the American Fuel Saving Company, Cleveland, Ohio, manufacturing furnace appliances.

The Asbestos Protected Metal Company, Beaver Falls, Pa., states that the Pennsylvania Railroad has standardized asbestos protected metal for the inclosing of all buildings using sheet metal roofing or siding except those of a most temporary character. Recent orders include a freight station at Harrisburg, freight sheds at Uniontown, dock buildings at Baltimore, Md., and pier 29, North River, New York. The Asbestos Protected Metal Company is the only producer of colored asbestos felts in the United States at the present time.

The Defiance Pressed Steel Company, East Defiance, Ohio, is building a new warehouse, but states that it will not require any new machinery.

A new lodge of the Amalgamated Association has been organized among the employees of the sheet mill plant of the Trumbull Steel Company at Warren, Ohio, which was started up several weeks ago.

British Iron and Steel Exports Falling

The exports of British iron and steel for the first nine months of this year show an increase in tonnage and values as compared with the same period in 1912. The total sent abroad up to October 1, 1913, excluding iron ore and including scrap, was 3,811,918 gross tons as against 3,632,388 tons up to October 1, 1912, an increase of 179,530 tons. The increase in values for the same period in 1913 is £6,425,883, the total exports up to October 1, 1913, being valued at £41,267,764 as compared with £34,841,881 up to October 1, 1912. Exports of pig iron continue to show a decrease, the total, including ferroalloys, being 850,859 gross tons up to October 1, 1913, as against 968,934 tons for the same period in 1912. The exports of galvanized sheets were 98,496 tons greater up to October 1, 1913, than for the first nine months of 1912, totaling 561,637 gross tons.

The import figures for iron and steel, excluding iron ore and including scrap, for the first nine months of 1913 show an increase of 232,119 gross tons, totaling 1,708,174 tons up to October 1, 1913, as compared with 1,476,055 tons for the same period in 1912. Values for these periods are £11,496,463 and £9,361,926 respectively.

Total exports are continually decreasing, being 60,000 tons less for September, 1913, than for September, 1912. If similar decreases are shown, as the London Iron and Coal Trades Review considers is not unlikely for the remaining three months of the year, the exports for 1913 will not exceed those for 1912. It is found that the exports of pig iron for the first nine months of this year are at a lower rate than in any like period in eight years, due to the immense increase in the pig-iron capacity of Canada, France, Belgium, Germany and the United States. The exports of ferromanganese for 1913 look like reaching record figures, the probable total being 180,000 to 190,000 tons or about one-fifth of the pig iron exports in tonnage and one-third in value.

Petry-Cassidy, Inc., 1427-33 Vine street, Philadelphia, have changed their firm name to N. A. Petry Company, Inc.

Steel Meeting of the Mining Engineers

(Continued from page 905)

gases entering the boiler at 700 deg. C. and leaving at 350 deg. C.

The second was a contribution by George C. Stone, chief engineer of the New Jersey Zinc Company, New York, who held that if the temperature of the gases is not higher than 300 deg. C. there is no economy in their use. At the plant of the New Jersey Zinc Company, Palmerton, Pa., he has found that with gases at 450 deg. about 3 hp. can be obtained for each ton of coal gasified, and that this is increased or decreased by 1 hp. for a variation of 50 deg. in the temperature of the gas entering the boiler setting. In Germany similar furnaces fired with gas from bituminous coal have given rather better results, as they were equipped with especially designed water-tube boilers. Both here and in Germany, he added, the use of the boilers has had no visible effect on the working of the furnaces.

In the discussion D. S. Jacobus said that the Babcock & Wilcox Company had spent large sums in investigating the use of waste heat for boilers and that among other things they had learned that as a rule it is not economical to use gases having a lower temperature than 1100 deg. F. (600 deg. C.), though much would depend on individual cases. Of course, special construction in the use of baffles, etc., was necessary.

Over-Oxidation of Steel

Considerable interest was manifested in a paper by W. R. Shimer, metallurgist, Bethlehem Steel Company, on "Over-Oxidation of Steel," which was read in abstract by E. O'C. Acker, metallurgical engineer of the company. The object of the investigation was to study, by both chemical and metallographic means, the extent of over-oxidation of steel that can be accomplished by excessive over-blowing in a Bessemer converter as well as to study results with basic open-hearth and crucible steel. The highest oxygen contents obtained by over-blowing were 0.074, 0.064 and 0.049 per cent. oxygen, notwithstanding that the tests were taken immediately and cooled quickly to prevent escape of gas. By oxidizing with ore percentages of 0.029, 0.028 and 0.033 per cent. oxygen were found on samples taken immediately after the ore begins working through the metal; allowing time for the oxygen to escape after the ore addition, a content of 0.017 per cent. oxygen was obtained. A basic open-hearth heat under oxidizing conditions gave only 0.024 per cent. oxygen.

Some general conclusions are that excessive oxygen leaves the bath of molten steel in a very short time and that deoxidation is readily effected by the addition of hot metal. It was also deduced that the higher the carbon the lower the oxygen. It seems highly probable under the usual conditions of Bessemer and open-hearth practice, with the addition of recarbonizers, that a steel of over 0.030 per cent. oxygen can be obtained, and that the highest obtainable under any conditions without recarbonizing, can hardly be over 0.075 per cent. Results higher than this must be from drillings improperly taken or from oxidation that occurred during teeming.

As is usual, whenever this subject is brought up, various differences of opinion are expressed regarding the Ledebur method for determining oxygen in steel and the discussion brought out opinions from Dr. Allerton S. Cushman, Prof. Joseph W. Richards, and others. Dr. Cushman upheld the value of the method as furnishing the percentage of oxygen as it exists in steel in the deleterious condition while Professor Richards held that the vacuum method for total oxygen was also necessary in arriving at valuable conclusions.

J. E. Johnson, Jr., was of the opinion that the deoxidation of oxidized steel was largely a matter of temperature rather than of chemistry and that probably this is one reason why the electric furnace with its high temperature is so efficient in producing a pure steel. It was the opinion of Professor Sauveur that if the increase of only 0.03 per cent. of oxygen in steel was productive of bad steel then something must be wrong in the results or elsewhere. And yet in the opinion of Dr. Cushman only a little oxygen is very harmful.

Influence of Copper on Steel

The influence of copper on the physical properties of steel was the subject of a paper which aroused a long well-presented discussion by Dr. Cushman. The author was Prof. G. Howell Clevenger, associate professor of metallurgy, Leland Stanford, Jr., University, Palo Alto, Cal., assisted by Bhupendranath Ray, Calcutta, India. An extended investigation was made of material with varying percentages of copper cast in 30-lb. ingots. Weldability, segregation of copper, corrosion, microstructure, tensile strength, hardness and other properties were studied. Some of the findings are:

In making copper steel by the crucible process it is necessary to "kill" the metal before adding the copper, and just before pouring it is advisable to add a small amount of some deoxidizing agent.

Up to 0.846 per cent. of copper our steels gave satisfactory welds. At 1.857 per cent. the weld was much weaker and above this point the steel could not be welded.

There appears to be a marked tendency for copper to eliminate sulphur.

The segregation of copper toward the bottom of the ingot begins to be slightly noticeable with 0.846 per cent. of copper. With 2.773 per cent. of copper the segregation is more noticeable and with 4.512 per cent. of copper it is very marked.

The presence of small percentages of copper up to 0.493 per cent. has a most marked effect in preventing the corrosion of steel by dilute sulphuric acid. As the percentage of copper increases, the loss by corrosion increases until with 2.773 per cent. of copper the loss is greater than when the steel does not contain copper.

The elastic limit in both the annealed and the unannealed specimens increases steadily until with 4.512 per cent. of copper it was increased more than 100 per cent. over that of steel containing no copper. Within the limits investigated the ultimate strength appears to increase almost in direct proportion to the amount of copper present. With the unannealed specimens the actual breaking strength in all cases was the same as the ultimate strength. The actual breaking strength in the case of the annealed specimens shows an increase with the increase of copper.

The hardness of the steel increases with increasing copper content and corresponds fairly well with the tensile tests.

Discussion by Dr. Cushman

Dr. Cushman, in discussing the paper, said in part:

The impression is abroad that a new and wonderful cure-all has been discovered, a method of alchemy by which with a few cents in copper it is possible to change marvelously the characteristics of steel, in effect is producing a new metal. With all the advances that have been made we have indeed merely scratched the surface of the possibilities of usefulness of the alloy steels, even of what might be called the dilute alloy field.

He felt that he was competent to speak on the corrosion of steel, and regarding the resistance to corrosion he had specialized to quite an extent. Four years ago he received a commission from a large manufacturing concern to use an open-hearth furnace for exploring this particular field. No metallurgist, he suggested, but could realize the generosity of a manufacturer permitting one to pursue his theories with 60 tons of molten metal. He threw copper into the open-hearth furnace. He explored the alloy field, not in a little crucible and with small tests, but with 60 tons of each alloy, in covering the field reported on by the paper. Each heat was manipulated to roll the finished product, and then an elaborate series of tests was taken for weathering. In addition, every possible laboratory effect was considered to study the influence of copper on resistance to corrosion, as he had hoped that he would at least find some such solution. He was disappointed because there did not seem to be any tests under service conditions of material in which copper added to the iron base had produced any improvement. As time went on, it was shown that copper should be avoided. He admitted that he was exploring the use of copper in connection with a pure iron base, rather than with a steel base, and to be perfectly conservative these results had only an indirect bearing on the copper-steel range.

Since his early experiments extravagant claims have been made, he said, that by the use of about 30 cents' worth of copper added to a ton of metal wonderful results had been attained. He had explored that range by making copper steel and had a piece of machinery at his disposal, by means of which he could saw in a reasonably short time the regular 18 x 20-in. ingots weighing 5000 lb. apiece.

Shortly after a heat it was possible to tell what the inner conditions may be, and he found there was likely to be a good deal of segregation, and, in fact, the authors had evidently run into it also for the reason that they had recommended the use of a deoxidizer.

He felt that while the acid test was not a measure of the resistance of a material exposed to the weather and while a well-made copper steel will resist acid better, he considered that there was no guarantee in the average case that there was no segregation, and even if there was no other evidence than the theoretical, he would want to wait for actual evidence. He expressed the belief that he has under observation more tests on corrosion than any one else in the world, and has yet to receive the evidence.

He mentioned briefly a test made with a large manure stack, composed of slats of corrugated metal. This stack was filled with manure two years ago. The first slats to go were those of copper steel, the second of copper-iron and the third of ordinary steels of commerce. He was well aware that other tests have been published that are not in agreement with his observations, but he felt that such differences were not unusual, and at any rate the one solution was the test of time and not an exposure of one year or nine months.

Capt. Robert W. Hunt referred to his having had brought to his attention in the last few weeks samples of a pipe line of 30 years' existence. He was under the impression that it was ordinary Bessemer steel, and he thought that perhaps it was made by Frank Hearne, who about that time directed attention toward soft steel. In other words, he felt that success in all these cases depended on having positively good steel.

Shock Tests of Steel Castings

The shock test for steel castings was revived by John H. Hall, consulting engineer, New York City, in an interesting paper, which argued that the Fremont test for measuring the energy consumed in breaking a notched bar of steel is not so well known in this country as it deserves to be. An experience of several years with the machine, he said, has shown its great value in readily detecting brittleness not revealed by tensile testing or slow bending testing.

He described in some detail the comparison of drop and tensile tests, together with metallographic studies. He found that the various heat treatments are of about equal value as judged by the tensile and bending tests, but the Fremont values are lowest in the slowly-cooled steel, considerably higher in the air-cooled and annealed bar and the bar cooled at an accelerated rate, and highest of all in the quenched bars, more than twice as high as in the slowly-cooled bar. That a steel low in carbon, silicon and manganese should be greatly improved in resistance to shock by quenching, as shown by his tests, points, he believed, to the great advantages of such treatment for castings that may be subjected to sudden severe stresses in service, such as machinery and automobile castings; and brings out strikingly the value of testing under sudden severe shock in revealing degrees of toughness in even a "dead soft" cast steel.

Shock and Tensile Tests Compared

Mr. Hall's paper was discussed at some length by Dr. H. M. Howe, who brought up the question whether the impact test is wanted rather than the tensile test. He held that it shows nothing that the tensile test does not, if the latter is done properly. He showed a number of charts to indicate that the results with the impact test are in a great many cases not proportional to the findings of tensile tests, but suggested that it might be a special test for fine structure material, say for that in the sorbitic state. He considered that the skin, so to speak, bears the lion's share of the work in the impact test, which is not the case to the same extent in tensile tests. He felt, also, that the impact test is affected greatly by plastic deformation. Steels of low carbon give a false notion of the value of the impact test. He thought that perhaps a good use of the impact test would be to compare the angle bent with the work done below the elastic limit.

In a discussion contributed in writing, it was contended that Mr. Hall had shown that the shock test yields more practical information than is obtained by other tests. Reference was made to tests of steel castings subjected to different heat treatments, and while tensile tests were indifferent to the changes in heat treatment, the shock tests showed a range of 170 to 670 ft. lb., or a range of 293 per cent. The case of an over-oxidized steel was mentioned, showing a tensile strength of 72,000 lb. per sq. in. and an elastic limit of 34,000 lb. The shock test gave 429 ft. lb., while with a specially treated specimen, showing 73,000 lb. tensile strength and 38,000 lb. elastic limit, the drop test gave 616 ft. lb. or 43 per cent. greater resistance. It was concluded that the tensile strength shows little of the differences while the drop test does.

W. R. Webster, Philadelphia, and Dr. Leonard Waldo, New York City, also entered the discussion, the latter explaining in some detail the application of the Charpy machine. J. E. Johnson, Jr., suggested the advisability of ascertaining the dynamic value, so to speak, of the material, by subjecting it, say, to the shock test when it is already under some initial stress, attempting in this way to simulate the conditions of service to which materials are subject commonly. Bradley Stoughton and Prof. William Campbell, of Columbia University, both referred to shock tests made on gear teeth, some of the main points of which were contributed about two years ago to the American Society for Testing Materials. Professor Campbell felt that one objection to the Fremont machine was that it had to be calibrated frequently.

It was also suggested in the meeting that in a shock test there is a tendency for rupture to take place in a straight line as differentiated from the tensile stress in which there is a relatively slow pull with the opportunity for an internal re-arrangement of crystals to take place, so that the break which follows takes the line, so to speak, of least resistance. A point in this connection is that the material between the crystals is amorphous and stronger than the crystals themselves and that the more of the cementitious matter, the stronger is the steel itself, and, of course, naturally, the more the amorphous material, the smaller the grains.

Absorption of Carbon by Alloy Steels

A paper on "The Influence of Various Elements on the Absorption of Carbon by Steel" was presented by Robert R. Abbott, metallurgical engineer, Peerless Motor Car Company, Cleveland, Ohio. It covered experiment on no less than 208 steels of different chemical composition selected to represent most of the types of modern constructional steels, including nickel, chrome nickel, chrome-vanadium, chrome, chrome silicon and silicon steels. The results as regards increase in weight of carbon for the various steels, according to the carbon content; and also as the carbon absorption is affected by the percentages of nickel and manganese are shown in tables and by a few charts.

Dr. J. A. Mathews, Halcomb Steel Company, Syracuse, N. Y., opened the discussion. He paid a tribute to the evident painstaking work of the author, referred to the work in a similar line given in a paper presented last year before the American Society of Mechanical Engineers by Mr. M. T. Lothrop, and referred to the quicker case hardening and deeper penetration ordinarily obtainable with chrome nickel steel. He felt that Mr. Abbott's grouping was not always quite plain, and he would like an explanation in this connection.

Prof. Albert Sauveur, while expressing great admiration for the work in general, asked if the estimation of carbon made by the author was altogether reliable. He doubted the expediency of the author's employment of the theory of least squares for correlating the observations on the penetration in case hardening, and offered as something substantially as good, a formula, as follows:

$$P = 100 - 50C - 7Ni + 20Cr.$$

The use of the formula is that knowing the composition of the alloy as regards the percentage of carbon, nickel and chromium, it is possible to ascertain the penetration. The penetration of pure iron is taken at 100 per cent., and this is reduced by the percentage of carbon and of nickel but stimulated by the presence of chromium. Professor Sauveur did not advise reliance on the formula, but suggested that it might nevertheless be of some use.

Some of the General Papers

One of the papers of more or less general nature was contributed by Clarence P. Linville, superintendent of blast furnaces, Everett, Pa., giving a chart, based on the

researches of Willis H. Carrier, to ascertain readily the moisture content of air per cubic foot corresponding to given wet and dry bulb temperatures.

A paper by William H. Blauvelt, Syracuse, N. Y., on the slagging producer, was also contributed.

The future of the chilled carwheel was presented in a paper by P. H. Griffin, New York. The author points out at length that formerly good service was obtained from wheels made of about half charcoal iron,—figures, in fact, strongly convincing in this respect being submitted,—while the quality of chilled wheels made since 1900 has not been satisfactory. Accordingly he considers that the future is dependent almost entirely on a return to a former practice of using part charcoal iron, with the details of manufacture and design modified to conform to present-day exactions of railroad service.

Life of Crucible Steel Furnaces

A monograph on the life of crucible steel furnaces was also presented by John Howe Hall, who emphasized that the life of a furnace was due in part to the furnace designer, in part to the manufacturer of refractories and in part to the operators. He pointed out that low-carbon steels and steels made from iron and charcoal require higher temperatures and much longer melting time than high-carbon steel or steel made largely from scrap; the life of the furnace will be shorter, and the number of heats melted will be much less, when such materials are melted. The figures available, showing the life of furnaces, are for this reason especially not strictly comparative. The paper was called out by the record of the Columbia Tool Steel furnace of a continuous run of 45 months and 11 days, for a total of 6290 heats. A strong foundation was provided to guard against settling and consequent wracking of the furnace; the furnace was set with the working floor only about 31 in. above the ground level, so that the radiation of heat was minimized, tending to discourage contraction of the furnace and consequent wracking of the brick work; and the walls between checker chambers which are frequently but 12 in. thick were made 18 in. thick to insure against the leakage of gas into air chambers and flues that commonly occurs when the furnace grows old. The holes were lined with silica brick of standard make; breast walls, flues between checker chambers and melting holes, checkers, etc., were of first quality clay or firebrick.

The meeting on Friday morning was taken up entirely with papers and discussions of the various questions relating to the position of the recalescence and calescence points in the iron-carbon alloys and the critical ranges of A_2 and A_3 in pure iron, the highly scientific phases being ably presented by Dr. Howe and G. K. Burgess of the Bureau of Standards, Washington. The discussion was participated in by Prof. Sauveur, Dr. Howe and others.

Rapid Analysis of Alloys

At the close of the session opportunity was given to F. Twyman, manager, of Adam Hilger, Ltd., London, to present a description of a "spectograph for the rapid analysis of alloys, including steels, under industrial conditions." It was as follows:

Three years ago the firm of Adam Hilger, Ltd., London, took up the problem of the production of a spectograph—that is, an apparatus for the photography of spectra—which should enable an unskilled operator in a metallurgical laboratory to lay before his technical director a photograph which should present a permanent record of the metallic constituents of any sample. As a result they have now placed on the market an apparatus permitting this to be done. The routine to be followed by the operator is as follows:

Two small pieces of the sample (a nickel steel, let us suppose) are held in suitable clamps in front of the spectrograph. They are connected up to the electric supply with such a resistance in series as will give a current of from two and one-half to five amperes passing from one to the other. A small electric arc is thus produced between the two pieces, the light from which when analyzed by the spectrograph produces a series of spectrum lines which are characteristic of the metallic constituents of the sample. A photographic plate having been placed in the dark slide of the spectrograph an exposure of 10 seconds is made. A second exposure is then made using, instead of the sample, pieces of steel known to contain none of the constituents in which one is for the time being interested. A mechanism is provided whereby the two photographs of the spectra thus produced are formed one immediately below the other, the iron lines all exactly coinciding. Any lines in the sample which are not due to iron can at once be detected, and the identification of the constituents is then an easy matter. The whole operation of taking the photographs, developing, fixing, and drying the plates, can with suitable appliances be performed in 20 min.—the examination can then be performed at leisure by a skilled observer. It is stated that the results are quantitative only to a degree, indicating large or small percentages by the number of lines.

Work of the Bureau of Standards

Before final adjournment, a resolution, presented by Captain Hunt, was carried, to the effect that as the United States Bureau of Standards is engaged in valuable work of scientific and commercial interest to this country, those present at the Iron and Steel Committee meeting of the American Institute of Mining Engineers urge on the Government authorities the supreme importance of proper financial support to that Bureau, and that owing to the importance of the subject other organizations be requested to act in the matter.

A New Pipe Cock of the Spring Plug Type

To overcome disadvantages of the ordinary or through plug style of cock, the National Tube Company, Frick Building, Pittsburgh, Pa., has brought out one of the spring plug type. This cock has an inverted plug with a spring at the bottom, which constantly presses the plug firmly against the seat. While the plug ordinarily turns easily, if it should stick a blow on the top will loosen the plug, which is immediately reseated by the spring. This is an advantage as compared with the ordinary type, as when the plug becomes loose the workman frequently injures it in tightening. It is pointed out that if the plug should become cemented to the body the common practice is to loosen the nut and drive up the plug with whatever tools are at hand, no especial care being taken to adjust the plug properly afterward. In this new type the spring at the bottom eliminates this trouble. These cocks are furnished with iron bodies, brass plugs and springs or are entirely made of brass for steam, water or compressed air service, and also made throughout of iron for alkaline solutions. Before shipment they are tested to 250 lb. cold water pressure and to 125 lb. compressed air pressure under water, and are recommended for a working pressure of 125 lb.

Meeting of Vacuum Cleaner Manufacturers

At a meeting of a number of manufacturers of vacuum cleaners held at the Hotel Secor, Toledo, Ohio, a few days ago, steps were taken toward forming an organization of manufacturers of all types of vacuum cleaners. The meeting was brought about through the efforts of Fred Bissell of the Bissell Mfg. Company, Toledo, who acted as secretary of the meeting. There was a fair representation present and it seemed to be the consensus of opinion that an organization would be of much benefit. An executive committee was appointed to get in touch with the manufacturers who were not present, and this committee probably will shortly issue a call for a meeting to effect a permanent organization. Makers of vacuum cleaners consider that there is a very broad field for their product, which as yet has only been developed to a limited extent. One of the purposes of the proposed organization is to start an extensive general publicity campaign in behalf of the makers of vacuum cleaners.

That new uses bring new standards is indicated in the present practice, for example, of the Simplex Wire & Cable Company, Boston, which recently adopted 1000 ft. as a unit of length for all factory measurements of wires and cables. The standard is probably very largely the result of the fact that heavy cables are now commonly used underground, and distance is necessarily measured in feet, as from manhole to manhole, rather than in miles. The new standard or unit naturally makes it unnecessary to use often the cumbersome factor of 5280, the number of feet in a mile.

Some of the Troubles of Malleable Foundries*

Difficulties in Making "Low" and "High" Irons—The Melting Problem Discussed and the Evils of Over- and Under-Annealing

BY RICHARD MOLDENKE

That the troubles incident to the production of malleable castings are far more trying than those experienced in other branches of the iron foundry is due to the fact that about half the material melted consists of shop scrap. Any deficiencies in the stock purchased or in the metal produced through poor practice ingrafts itself upon the scrap, and unless promptly diagnosed and corrected becomes more aggravating from day to day, ending in serious commercial disaster. The unfortunate phase in the situation is that once the trouble has been located and corrected, the malleable man has the disagreeable prospect of taking a week's work from the ovens, all of which he knows to be of inferior quality.

In spite of the fact that the malleable process has not been changed or much improved since the earliest times—simply because radical changes in the heat treatment applied takes the material entirely out of this class of castings—the subject requires a life study, and even with such an experience much that occurs must be left to scientific speculation. With the constantly increasing researches being made into this fascinating subject, there is reason to believe that we may soon know more—provided that the students base their conclusions upon actual practice combined with laboratory research, and not the latter alone.

Let us first enumerate the more prominent "malleable troubles," try to locate their cause and finally suggest the cure in each case.

"Low" and "High" Irons from the Same Heat

The two principal characteristics of bad malleable castings are the so-called "low" and "high" irons. In the range of malleable work, depending primarily upon the silicon content, thickness of section, and to a smaller degree the temperature of the metal poured, there will be found on one end of the series the extremely weak, gray fractured metal, absolutely ruined through oxidation in annealing the hard castings. This is sometimes so open in structure, through oxidation of the graphite which should not have been there, that on breaking a piece of this extremely "low" iron, the fracture is highly colored with bands of blue, red and yellow alternating through it and showing up the arrangement of the crystallization scheme very nicely. This "calico" iron is perhaps the very worst trouble the malleable casting producer can have, for it is more dangerous than the commonest cast iron.

From it—as the deposition of graphite in the original hard iron becomes less and less—we get the malleables that approach ordinary gray iron in strength, and might as well have been made in the cupola and not annealed. Still a little better, and we have malleables which are eminently suitable for work which must be machined like cheese, and yet be soft enough not to fracture under shock too readily; as, for instance, air brake light parts, and in the better grades, pipe fittings. Metal of this kind is, however, made quite specially, in separate heats, as getting this material into important work is too serious a question.

The range of malleables now comes into the good work, and here there is a fair chance to get heavy and light work from the same heat, if the proper portion of the bath as it empties out of the furnace is caught. This naturally relates to "furnace" iron and not cupola work. We have here the two characteristics of white iron to make use of. Granted that there is a slight lowering of the silicon during the tapping process, as it usually takes a half hour to an hour to get out the ordinary heat, and the heat itself having been ready to pour into castings when tapped, the first part, with higher silicon, would be more suitable for lighter castings than the last, if hot enough to pour at all; whereas the last iron, even if ordinarily too high in silicon to be safe if poured cold, will come out all right on account of the extremely high temperature existing in the metal at the end of a heat.

Very light castings, of course, must be poured from the hottest iron made; and hence those works in which the heavy range of car castings are produced have their difficulties in making iron suitable for strong heavy castings, and yet turning out quantities of very light castings with the same metal, and with consequent heavy losses from misruns, blows and the like.

Evils of Adding Ferrosilicon

I have always felt that the solution in cases like this is to make the mixture low enough in silicon to suit the heavy work. Tap out that portion of the heat, close up the breast, add ferrosilicon enough to the bath to bring the metal to a silicon content proper for very light work, allow to heat up properly, and tap again to pour all the light castings. I may say right here that this method of procedure is recommended with much reluctance, as there is nothing worse than having to add silicon to a heat of malleable where strong heavy sectioned "specification" metal is wanted. This is never necessary unless the heat has been run wrong in the first place, or the bad policy of using a furnace larger than 20 tons capacity has been adopted. Metal in melting is under oxidizing influences all the time it is in the furnace, and hence it should be the aim of the melter to get his metal under a slag cover as rapidly as possible; next to heat it up as rapidly as the furnace will permit, and finally to tap out as fast as men can take it away.

Given a heat melting in about two hours longer than the normal, there is a gradually increasing percentage of iron oxide dissolving in the bath, while the silicon content is lowering abnormally. Adding ferrosilicon, intended to restore the silicon content and actually doing this, also deoxidizes the bath. This looks good on the face of it, but unfortunately the products of this deoxidation have a way of not rising to the top very quickly but of remaining scattered throughout the bath of metal and going into the castings. So here we have a theory which does not work out, and the reason is that malleable temperatures are too low. In the case of a steel casting heat we have a temperature hundreds of degrees above that of malleable—which in even the hottest condition is lower than ordinary heat for gray iron work—and consequently the deoxidation is rapid, and the slag formed rises out of the metal in time for efficient use. That this is not the case in making malleable, I know not only from actual pyrometric readings of the metal taken in the furnace and just before pouring the molds, but from years of records of tensile and transverse tests made on the first and last portions of thousands of heats. I claim that the addition of ferrosilicon to heats lowers the value of the metal for making castings. You can prove this for yourself by taking a series of observations, not isolated cases, on test bars cast from the first and last of heats—not the middle. Further, by taking not half inch square, or three-eighths inch round bars, but good big inch square test bars. These will tell the story without deceiving yourselves.

The practical application of the above lies in your melting arrangements. A malleable melter knows how to distribute his charge in such a way that it melts in the shortest time possible. A steel melter dumps the charge in incongruous heaps. Result, a heat longer by at least half an hour for the same tonnage. The malleable melter works his metal to promote uniformity in temperature and acceleration in getting ready for the test and then the tap. The steel melter sits down and lets the heat simmer. When the test eventually shows that the silicon has fallen

*A paper read before the American Foundrymen's Association in Chicago, October 14 to 17.

too low, that is, the plug shows white iron throughout, with fine pin holes along the rim, he adds ferrosilicon and sits down again. When hot he taps. The comparison between the two methods is best shown from the fact that, say, a 10-ton heat from the air furnace takes a malleable melter not over four hours to get ready from end of charging to time of tapping. The same heat will often take the steel melter seven hours.

Results from Practical Experience

To recall my own practical experience, I will mention that for years, with self-trained malleable melters, the tensile strength of daily heats ran up to 51,000 lb. per sq. in., and the same 1-in. square test bars would bend up to 2½ in. before failing. Then a steel melter was given charge of the furnaces. The heats soon increased in length, ferrosilicon was added as a common occurrence, and the average strength of the test bars dropped down to about 43,000 lb. per sq. in. Moral: Keep steel melting methods out of the malleable shop, watch the firing so that a uniform stream of intensely hot flame heats up the brick work of the roof and side walls of the furnace, and no cold air puffs from open furnace doors check this temperature any more than may be necessary.

To return again to the original argument, after this ferrosilicon digression: From the good work, after leaving the "low" iron range, we get into the so-called "high" irons. As the silicon content in the metal becomes lower, the heats longer than necessary, and the metal hotter, this begins to show signs of gas formation within the structure, noticeable more particularly on the surface of the castings. The fracture, instead of showing the characteristic fine band of white for the skin, next the eighth inch or so band of gray to black where the crystals of iron have arranged themselves at right angles to the surface planes, and then the black interior, begins to show a broader band of white, indicating that by reason of a more open structure the oxidation effects of the packing and air currents in the saggers have penetrated more deeply into the castings. The castings are weaker, the surfaces not as smooth, the edges become rounded, in bad cases the metal has wasted heavily by scaling off, and as this trouble progresses, the material finally becomes brittle and unsalable. At all times, however, so long as there is an annealing action, the metal is not as bad as "low" iron. Hence it is better to err on this side of the series than on the high silicon side.

Now, unfortunately, it is quite possible to have "burnt" iron, with the proper silicon content, and that brings us to the melting problem. Before going into this, however, it may be stated that when the silicon gets so low that the hard castings are full of blow-holes, molds become short-poured even with very hot metal, and there is no sign of annealing effects on taking from the ovens, the other end of the series will have been reached.

As there is no establishment that sooner or later does not make all of the above described varieties of malleable, I would suggest that a cabinet of fractured pieces be established in the superintendent's office—preferably the broken test bars of 1-in. square section where heavy work is to rule, and 1-in. by ½-in. where very light work is made only—and that gradually the series from very "low" to very "high" malleable be accumulated. Some 30 pieces, each one showing a shade different from the next, can thus be had, and this series forms the best kind of a sermon for the edification of the foremen and melters when things go wrong. Moreover, a watchful president strolling through the shop can pick up a few castings, have them broken, and compare fractures with this standard series of "bad to good" and "good to bad" in a line.

The Melting Problem

As to the melting problem, I will say that variations in temperature and time in the anneal may ruin a good hard casting, but not even the best annealing practice will make a poor hard casting into a good piece of malleable. Hence, before condemning the annealer it is always well to look into the melting practice first—presuming that normal irons and scrap have been used.

In melting iron for malleable in the cupola nothing more can be said than that the precautions to be taken for gray iron apply here more particularly even, as we deal with very low silicons. Here the charges must be very small to avoid fluctuations in the position in the melting zone, and, moreover, it is necessary to melt quite high in the melting zone, in order to keep away from every possible chance of oxidation. Hence a very low fuel efficiency is essential.

In the case of the air furnace, as well as the open-hearth furnace, the first thing to watch is the charging. As stated above, the careful melter so disposes his charge that the sprues melt first and form a pool of iron into which he can throw one pig after the other from two piles carefully laid in regular order as if in the stock yard. If possible these piles should be spread over the furnace bottom somewhat, so that they heat up in quickest time. But they should be laid perpendicular to the side walls, so that an iron bar inserted into the furnace will push one pig at a time into the bath as desired. There seems to me nothing more unsatisfactory and inefficient than to see a melter try to loosen up a pile for this purpose and perhaps break off a little at one end of a softening pig, the other sticking fast within the pile. Naturally he gives up when physically exhausted, and nothing of value is accomplished. The pile simply has to melt down of its own accord and not assisted by the melter. The result, however, is that the heat is longer, coal is burned unnecessarily, and worst of all, the iron is injuriously affected.

Precautions in Firing

Next comes the firing itself. In the case of the open-hearth furnace, with gas or oil firing, the problem is simple enough for this end of the operation. The care of the furnace is another matter. In the air furnace, however, the greatest possible attention should be given to the problem. As in boiler practice the best results are obtained by the clockwork-like precision of opening the door, inserting coal close to it, closing to allow the coal to begin coking and at the same time giving off gas to pass over the hot bed of fuel, then opening the door and pushing the coals over the fire bed, etc., so also in air furnace practice this routine should be followed out. There is this extra precaution, however, in the latter case. In boiler practice about 100 per cent. air in addition to that theoretically required is allowed to enter, and thus the maximum value of the coal is obtained. In air furnace practice, however, where we need extreme temperatures rather than high fuel efficiency, not more than 25 per cent. extra air should be allowed into the fire-box end of the furnace, otherwise the heat will be prolonged unduly. It is not the flame that does the best melting, but the radiation from the incandescent brickwork of the combustion chamber of the furnace, which means that a surface as unbroken by defective doors, etc., as possible, heated up to the highest degree safe for the bricks, and kept that way steadily by a stream of uniform fire should be presented to the metal charge. In how many establishments is this the rule? I have seen but few myself. There is more room for improvement here than anywhere else. A very efficient furnace charging door on the market, in which it is impossible to open the door at all while firing, has solved this problem nicely. Indeed, it was gotten up at my suggestion, and worked out into its present shape during trials made to show the melters affected that it was possible to get out excellent heats without open fire doors—a thing claimed impossible by them—where the furnaces are so proportioned that a 20-ton heat was not expected to be taken from a 10-ton furnace.

Chain Grate Essential to the Air Furnace

In spite of this excellent arrangement, I cannot help feeling that for the class of coal always used for melting with the air furnace, the chain grate is the coming solution of the firing problem where the necessities of the establishment require the air furnace at all. Where a works has steady occupation for a furnace the year around, the open-hearth installation is the thing to put in—but to put in right. With this discussion on the melting problem understood, there is to be said that with proper mixtures and proper melting, so that when a heat is ready to tap it is also hot enough to do this, only high grade metal will result. Long heats, through poor firing, or inexcusable composition errors in these days of chemical laboratories, mean iron that goes to the anneal with every chance of poor results. To this should be added that even with the best of hot iron running from the spout, if a shank of, say, 150 lb. has to be carried to the other end of the shop before pouring a heavy section casting, trouble is almost

certain to result from "low" iron. Hence judgment should be used in placing the patterns, so that only hot iron may go where it is most needed.

While "low" iron usually pours like gray casting work—that is, with a minimum molding loss—even though the castings themselves are worthless, "high" iron, on the other hand, gives rise to a variety of casting troubles, such as shrinks, cracks, pin holes, blow and gas holes, etc. The molding loss sheets show astonishing black spots for castings that are sensitive to variations in the iron. There is only one grade of iron right for the malleable shop, and this grade can readily be made if the executive knows how to compel its production.

Annealing Defects and Their Prevention

Turning next to annealing troubles, while scientific investigation in laboratories shows all kinds of errors committed by the practical malleable man in keeping time and temperatures of the ovens as he has them, yet we all know the fate of establishments where quick anneal and high temperature practice has prevailed. The sheriff gets them. Unless, indeed, the Reaumur or Continental European process is used—where temperatures and times of anneal are used which practically decarbonize the metal (and thin metal only at that) so that the fracture is a steely white—the good old process taking 60 hr. of full temperature of around 1350 deg. F. for the coldest pot in the coldest part of the oven should be used. Then one knows that when the iron from the molding floor comes to the anneal, it will issue nicely and as a good material. If oxidized in the melting, no skill of the annealer can correct this.

The two troubles incident to annealing practice are "over-anneal" and "under-anneal." The former runs the temperatures too high, so that the metal opens up and the fracture shows heavy white bands, if not entirely white (but steely and not crystalline as in the hard casting); the latter shows but an imperfect change from the crystalline structure of the hard casting to the fine, soft gray of the good malleable casting. It is sometimes quite difficult to distinguish the two, particularly when a casting is almost fully annealed. On closely observing the character of the white rim, however, the distinction can be made, for when over-annealed the white band does not show sharp interior corners, but rounded ones, which, as the band goes inward further, eventually leaves the black-heart a round spot. A comparison of a number of fractures from the same oven will show a range of pieces which tells the story, as in the case of over-anneal there will be few good pieces, and none with the original hard structure, while with under-anneal there will be good castings and a few hard ones. In the latter case the whole charge, or at least the coldest pots, can be returned for another anneal. In the former there is no help.

It would carry us too far to go into the simple mechanical troubles like warping of castings or sticking of sand or scale. The solution of such troubles is self-evident.

The Steel Corporation Dissolution Suit

Continuance of Testimony by Iron-Ore Experts and Geologists—Consumers of Steel Find Open Market Conditions

At the hearing in New York City on Wednesday, October 15, in the Government suit against the United States Steel Corporation the submission of testimony for the defendant was continued.

Geologist Eckel Makes a Prediction

Edwin C. Eckel, geologist, who had been on the stand on Tuesday, was further examined. He declared that the center of steel production in this country, now geographically located in Ohio, must be moved to some point on the Atlantic coast between New York harbor and Norfolk, Va., by the spring of 1914 or our American steel producers will lose something more than 50 per cent. of their present heavy proportion of the export trade in steel products to their German competitors. Judge Dickinson, counsel for the Government, pursued this subject further, and the following colloquy took place:

Q. That is to say, in your opinion, unless the center of steel production is shifted toward the Atlantic coast by next spring a very large percentage of our proportion of export trade will be lost to American plants?

A. Exactly so. I have had no experience in foreign commerce, but I have very definite knowledge of the advantages which foreign furnaces have in securing their ore supplies and shipping their products.

Corporation Refused to Buy Southern Ore Lands

Charles Catlett, Staunton, Va., a chemist and geologist formerly employed by the United States Geological Survey, stated that he had made a detailed investigation of ore deposits and lands in the Birmingham district in the latter part of 1907, on instructions given by James Gayley, former vice-president of the United States Steel Corporation, and has made numerous visits to that region since that time. He said that he then recommended to Mr. Gayley that the corporation should buy all of the adjacent lands, as well as the Tennessee Coal, Iron & Railroad Company, which it was then taking over, but that no such action was taken nor did he ever discover the slightest interest among the Steel Corporation officers in the suggestion.

The witness read off cost sheets for September, 1907, to show that the furnaces of the Tennessee Company consumed more coke to the production of a ton of pig iron than other furnaces in the South. Furnace No. 2 of the Tennessee Company, he asserted, consumed 5006 lb. of coke in producing a ton of pig iron; No. 4, 4494 lb., and No. 6, 3470 lb. Other Southern furnaces ranged from 2500 to 3000 lb. of coke per ton of pig iron. The normal consumption of coke in pig-iron production for an efficient furnace was about 3000 lb. and lower. He said that the Tennessee furnaces, on the whole, had a very poor average performance, and the average cost to produce a ton of pig iron to the company, exclusive of interest on investment, depreciation, etc., was $11.88, which was, as far as he knew, higher than the cost at any other Southern furnace.

Carnegie Once Refused to Buy Tennessee

Mr. Catlett was cross-examined on Thursday morning. He said that in 1896 he was carrying on some negotiations with Mr. Carnegie for some Southern iron-ore properties. Mr. Catlett suggested to him that he consider the proposition of buying the Tennessee Coal, Iron & Railroad Company, which had been represented to be a large and valuable property. Mr. Carnegie replied that he would have nothing to do with that "football proposition." The witness had previously testified that in 1907 he had investigated the ore properties of the Tennessee and some other Southern companies, and had recommended their purchase to the United States Steel Corporation, but nothing had materialized from his reports. Upon the Government's question, he said the companies other than the Tennessee Company whose purchase he recommended to the Steel Corporation were the Sloss-Sheffield Steel & Iron Company, the Birmingham Coal, Iron & Railway Company and the Woodward Iron Company. He stated that in the course of his work in the South he had examined 3200 acres of land, only a portion of which was ore-bearing.

John Birkinbine Declares Ore Monopoly Impossible

John Birkinbine, Philadelphia, engineer, past president of the American Institute of Mining Engineers, said that the development of the iron and steel industry of the country is in no danger of being restricted by a scarcity of suitable ore. In response to a theoretical question from Mr. Reed, counsel for the corporation, he stated that there would be no trouble to secure sufficient ore resources

for the organization of a new steel company with blast furnaces located in Illinois, Indiana, Ohio, Pennsylvania or New York and consuming 1,500,000 tons of ore annually. He qualified as an expert on iron ore by testifying that he had examined deposits in 25 States of the United States, in addition to some in Canada and Mexico, and had served the Government in compiling various publications regarding the iron-ore resources of the country.

Mr. Birkinbine declared that no monopoly of the iron ore of the country by any steel company was possible. Speaking of the historic Cornwall mines in Pennsylvania, he stated that they had been producing ore since 1740, and their output now is about 500,000 tons annually, and the indications of exhaustion of this property are less marked than 20 years ago.

Consumers Testify for the Corporation

A number of steel consumers and some steel-making competitors of the corporation testified in its behalf on Friday.

Frederick W. Wurster, who was Mayor of Brooklyn in 1896 and who is president of F. W. Wurster & Co., operating a rolling mill in South Brooklyn, said there are 15 or 20 manufacturers who compete with his firm in New York, including the Carnegie Steel Company. He maintained that there had never been any price combination and that he always bought where he could get his material the cheapest. He was emphatic in asserting that during the past 10 years or more the prices on iron or steel bars had varied, and that there had been no absence of competition.

Warren S. Hallett, superintendent of supplies and purchasing agent of the Postal Telegraph & Cable Company, said that he bought 25 per cent. of the wire for that company from the American Steel & Wire Company, a subsidiary of the Steel Corporation, but that he gave his business to the lowest bidder and that competition was keen. He purchases annually approximately 1,000,000 ft. of wire strand and about 5000 tons of plain or telephone wire by competitive bidding process. His company distributed its contracts for telephone wire among various manufacturers, by securing bids, the lowest of which was always accepted.

Octavius N. Hutchinson, president Grand Crossing Tack Company, Chicago, Ill., testified that his company makes about 52,000 tons of tacks, barb wire, woven wire fence, rivets and staples every year, and also about 325,000 kegs of nails. He said the quotations had always varied since 1903, and added:

"The competition has been so keen that we have had to keep our eyes open all the time, and our ears, too."

August Pahl, purchasing agent for Hammacher, Schlemmer & Co., hardware dealers of New York City, said that he bought both from Steel Corporation subsidiaries and from independents, taking advantage of variations in price, quality and delivery.

Maximilian Lewinson, a contracting engineer of New York City, who erected many large structures, said he often obtained contracts for which the American Bridge Company, a Steel Corporation subsidiary, was also a bidder. He sometimes bought materials from the Steel Corporation and sometimes from the Bethlehem, Cambria, and other steel companies.

On Monday, October 20, the same class of testimony was continued. Among consumers who appeared and declared that competition existed in the market for Steel Corporation products were Morton W. Reid, purchasing agent of the American Tobacco Company; H. A. Keiner, manufacturer of soda tanks; E. B. Peters, purchasing agent of the New Jersey Zinc Company; Eugene E. Hinkle, of the Hinkle Iron Company; Solomon O. Puschman, buyer for Shalita Brothers, can manufacturers; John Tounsten, of the Greenpoint Metallic Bed Company; Frank L. Groff, buyer for various metal bed makers; Henry S. Northrop, of the Northrop, Coburn & Dodge Company, and John Hay, of the Hay Foundry & Iron Works. They said they bought sometimes from Steel Corporation subsidiaries and sometimes from independents, according to price, quality, and delivery. The different manufacturers solicited their business and they placed their orders on a competitive basis.

More buyers testified on Tuesday in behalf of the corporation. The point most favorable to the Government's case at this session was when Eugene McK. Froment, an iron and steel jobber, admitted under cross-examination that there have been times when the prices of several manufacturers have continued the same throughout several months. Other witnesses admitted that the market had been decidedly steadier since the formation of the Steel Corporation.

Alfred D. Clinch, a New York wholesale hardware dealer, said the price for nails was pretty constant. He buys 90 per cent. of his nails from the American Steel & Wire Company, a corporation subsidiary, but said he: "There is no money in nails. They are to the hardware trade what sugar is to the grocer. We have to handle them."

Other witnesses were John W. Ferguson, of Paterson, a building contractor; Adolph W. Vogt, chief statistician of the Steel Corporation; Arthur Rich Day, president National Pipe Bending Company, New Haven; John P. Curry & Co., Riverside, Conn.; Jacob D. Waddell, general manager of the Brier Hill Steel Company, and Wilfred A. Mauchee, manager of the Newark Spring Mattress Company.

Safety Progress in Pennsylvania*

Pennsylvania's Department of Labor and Industry and the Industries of Her Shops

BY L. R. PALMER†

Pennsylvania is justly proud of her industries, and we hope that some day she may be just as proud of her Department of Labor and Industry. June 1, 1913, the old Department of Factory Inspection was abolished and a new department created. Governor Tener has been called the father of this bill, and I believe we must all agree that it is one for which he deserves much credit. Following its enactment he appointed John Price Jackson, dean of the engineering school of State College, as commissioner, with authority according to the act to make appointments and organize a department that would promote alike the best interests of capital and labor. Serving as we do some 1,022,000 workers, who in turn are dependent in a measure upon the many millions of invested capital, it is well that a man was chosen who knows the value of both men and money, who knows that a big work cannot be done single handed, who knows that cooperation is a better motto than coercion.

The New Factory Act Relating to Accidents

We have heard much within the past year or two of the motto, "Safety First." The safety and welfare of the workers of our State have first place on our schedule. Our Pennsylvania records are far from accurate, and I believe one is safe in saying that scarcely 25 per cent. of her accidents have been recorded. The old factory act, No. 226, of 1905, called for reporting to Harrisburg of fatal and serious accidents within 24 hours of their occurrence. This act has not been observed. A new act, No. 408, of July 19, 1913, has been passed during the last legislative session. It is an extension of the earlier act and calls for reporting to the Department of Labor and Industry of all accidents that result in a disability of two days or more. The old act still holds and requires that fatal and serious accidents be reported within 24 hours. Under the new act it is expected that all accidents covered by it be reported as soon as possible, and, in order to provide for such accidents as may develop from blood-poison due to neglect or similar resultant disability, the 30-day limit clause has been inserted in the act. In case the spirit of the act is violated a fine of $100 is to be imposed. We find that our accident reports since the passage of this new act are increasing in number every day, but it will be several months before we will have any figures sufficiently accurate and complete to be of any value in making comparison of figures from other states.

Speaking of the work done by other states, we should not neglect to give credit to Wisconsin, who has reduced her accidents 50 per cent. within the year. I believe that it is fair to say that within Pennsylvania at the present time there are occurring 200,000 accidents each year. As-

*From a paper read before the Pittsburgh Foundrymen's Association, October 6.

†Chief factory inspector of Pennsylvania.

suming that we can but attain the efficiency shown by Wisconsin, you should be able to prevent 100,000 accidents in Pennsylvania within a year. Many of these accidents are fatal; thousands are serious. Is it not a great work that is before us?

The Men at the Head of the Department

It is gratifying and encouraging to know that the men of Pennsylvania's iron and steel industry have pioneered this safety movement; to know that in Pittsburgh an association was developed which initiated the movement that brought into existence the National Council for Industrial Safety, our first national safety organization, and I feel that our foundry industry should be congratulated for having the proud distinction of being called upon to furnish its first paid secretary, W. H. Cameron, of the American Steel Foundries, well known to you all as a live wire in this vital work.

Commissioner Jackson, during the sessions of the Safety Congress, outlined the organization of our department, and I wish to say that our law is one of the best pieces of legislation that has been submitted to any state in many years. It is planned to be in accord with business and humane principles. Provision has been made for an organization to include men drawn from the ranks of the employees as well as the employers.

The commissioner, as head of the department, reports direct to the Governor. The three bureaus—inspection statistics, mediation and arbitration—are but parts of the one department, the Department of Industry and Labor. The chief inspector or assistant commissioner is second in rank and reports to the commissioner, as do the chiefs of the bureau of statistics and the bureau of arbitration. Within the department are four experts, known as inspectors of the fourth grade; a chief medical inspector for consultation on sanitation and hygiene; a mechanical engineer, expert on accident prevention and devices and ventilation; a chemical engineer to work in conjunction with the chief medical inspector; a civil engineer, expert in fire prevention and building construction. With the co-ordinated assistance of these experts we expect to submit to the people, through the Industrial Board, practical rules and regulations for the effective enforcement of our present and future laws to govern the employment of labor.

To Co-operate with Other Agencies

The plan of our department, which has already been outlined by Commissioner Jackson, is to work in co-operation with all the agencies interested in industrial welfare and efficiency. Our organization is limited in number; our field is broad; our duties are many. It is therefore only by united effort that we can hope to attain the results for which the department was created. It is only through the active assistance of organizations such as your own that we can succeed in our work.

Through experience it has come to be an unquestioned fact that we "must reach the man before we can expect to reduce our accidents to a minimum." We find that 70 per cent. of industrial accidents come from careless methods. This can only be prevented by proper education and discipline. Plant safety committees, where organized, have aided materially in such education, and our department is preparing exhibits, permanent and traveling, and stands pledged to aid the plant manager in his campaign to further stimulate interest among his men in preventing accidents and improving sanitary conditions.

The C. J. Root Company, Bristol, Conn., manufacturer of automatic counters, wrought brass hinges, butts, metal stampings and hardware specialties, has just finished a plant addition, which is 40 x 120 ft., three stories, of brick and mill construction. The new building will contain the polishing, plating and lacquering departments, and also allow increased floor space for several of the manufacturing departments. The general contractor for the building was Carlos J. Waldo, Bristol. The sprinkler system, steam heating and electric wiring were done by the F. A. Shaffer Company, Bristol. The sprinkler tank and trestle were built by the Berlin Construction Company, Berlin, Conn., the tank itself being of 20,000 gal. capacity, supplied by Stephen B. Church, Seymour, Conn.

The Machine Tool Builders

The Opening of the Twelfth Annual Convention at New York

The twelfth annual convention of the National Machine Tool Builders' Association opened Wednesday morning, October 22, at Hotel Astor, New York, with President E. P. Bullard, Jr., in the chair. The attendance was large for the first session of a three days' gathering. Committees were named as follows:

Auditing, E. B. Welles, O. B. Iles and J. G. Blount.

Resolutions, C. H. Norton, F. L. Eberhardt and C. A. Johnson.

Nominations, W. A. Viall, H. W. Breckinridge and A. H. Tuechter.

General Manager J. H. Herron read the report of the Committee on Patents, in the absence of Secretary Charles L. Taylor, who is chairman of the committee.

Daniel M. Wright, in the report of the Committee on Nomenclature, submitted a resolution that because the name of the association "incorrectly describes the aim and purpose of the organization," it be changed to the "Metal Working Machine Makers' Association."

C. H. Alvord, for the Exposition Committee, reported that of answers received from members to an inquiry as to whether they would exhibit at the Pan-Pacific Exposition, a small percentage only were in the affirmative.

The session closed with an address by Clinton H. Scovell, Boston, Mass., on "Cost Accounting Practice with Special Reference to Machine Tool Rates."

The Producers Coke Company, Uniontown, Pa., has announced a revised list of coke makers for whom it handles the entire output of coke. The new list contains six more names as follows: Mt. Pleasant Coke Company, Consolidated Connellsville Coke Company, Genuine Connellsville Coke Company, Champion Connellsville Coke Company, Whyel Coke Company and Puritan Coke Company, having a total of 2064 ovens. The company has for some time past acted as sales agent for the following: Fayette Coke Company (Shamrock), Jas. H. Hoover, Century Coke Company, Magee Coke Company, Thompson Connellsville Coke Company, Tower Hill Connellsville Coke Company, Banning Connellsville Coke Company, South Fayette Coke Company (Fretts, Emery, Shirey, Coffman), Brownsville Coke Company, Plumer Coke Company, Gilmore Coke Company and Orient Coke Company, with a total of 2999 ovens. It now represents 5063 ovens.

The Holt Mfg. Company, Stockton, Cal., and Peoria, Ill., has been advised that the 60-hp Caterpillar gas tractor entered by the company in the Argentine traction engine contest has captured the first prize, amounting to $15,000. This is the second year that the Holt Caterpillar has won the Argentine contest. This year 12 tractors were entered by American and foreign manufacturers. The first four places were secured by American-made machines and the fifth by a French machine. The first prize was $15,000; the second, $10,000, and the third, $5000. The Holt Caterpillar also won the traction contest this year at St. Petersburg, Russia, resulting in an immediate order from the Russian Government for two machines for military purposes.

The liquidators of the Canada Iron Corporation have completed arrangements for the continuing of the foundry portion of the business, which comprises plants at Fort William, St. Thomas and Hamilton, in Ontario; at Three Rivers, in Quebec Province; and at Londonderry, in Nova Scotia. It is announced that it is not proposed to operate the furnace and mine departments of the corporation during the period of liquidation. Some of the plants are already closed, and the others will probably be closed shortly.

The Pittsburgh Crucible Steel Company, Pittsburgh, Pa., is offering to the public bonds to the amount of $1,500,000 to finance improvements and additions being made at Midland, Pa. A new blast furnace is contemplated at Midland, which will likely be erected next year, but which has not yet been authorized.

The Machinery Markets

Conservatism in buying and resultant quiet prevail in all the machinery markets. Complaint of slow collections is more general and in some cases extra discounts are offered to accelerate payments. Another feature that is commented on, especially in the New York market, is the freer offering of second-hand machinery. In New York sales continue scattered and mostly of the kind dictated by urgent need. Business continues dull in New England, where slow collections are felt. Sales of small calibre have been the rule in Philadelphia, and the dullness is a little more pronounced. The tendency of both railroads and industrial companies to hold off in buying has made the Cleveland market inactive, except for small orders. An improvement in export trade is looked for at an early date in Cincinnati, but domestic conditions are dull and not much improvement is expected this year. Detroit shows no betterment and some automobile companies are laying off men. Interest in machine tools in Chicago in the last week has been centered in the exhibition conducted in connection with the foundrymen's convention, and the fact that several sales were made at the show is regarded as a good augury. In Milwaukee there have been some good bookings of orders, but the market is sagging and on the whole hardly satisfactory. In the Central South there has been some improvement, despite complaints of tight money and slow collections. In St. Louis conservatism is holding back activity. The machinery demand is lighter in Birmingham, but the business in power equipment is good. Texas is dull, but is looking forward to a more active demand for irrigating machinery. The trade on the Pacific coast is awaiting the placing of orders for equipment to go on a navy repair ship, but conditions generaly are below expectations.

New York

NEW YORK, October 22, 1913.

The market continues quiet with buying almost entirely restricted to urgent needs on the part of manufacturers, which means that sales are scattered and small individually. The recent buying of a large though curtailed list by the Western Maryland Railway is pointed to as eliminating the only big proposition before the trade. Half a dozen machine tools, including a miller, lathe, shaper, drill and two grinders, all motor-driven, have been purchased by the Will & Baumer Company, candle manufacturers, Syracuse. These tools are to be installed within the next two months and the company states that it may require other equipment a little later.

A feature of the present situation is the large number of second-hand machine tools and equipment offered for sale. Included in these offerings was the machinery of the Diamond State Steel Company, Wilmington, Del., on which sealed bids in a trustees' sale were opened October 22 and the forging plant of the A. P. Witteman Company, Chester, Pa., disposed of at receivers' sale, October 15. Other sales have been of industrial concerns where more or less general equipment was to be found. On October 29 the entire equipment of the Anthony Screw Company, Worcester, Mass., embracing many machine tools, will be sold at public auction by William G. Lord, Athol, Mass., while on October 30 478 lots of machine tools and other machinery and mechanical equipment of the Middleby Auto Company, Reading, Pa., will be disposed of at public auction. The last named sale will be conducted by J. E. Conant & Co., Lowell, Mass., for the executor of the estate of Joseph Middleby. Aside from the catalogues covering these sales, dealers in second-hand machine tools are receiving more than the usual number of communications from manufacturers who are anxious to dispose of any surplus tools they may have. Still another feature is that extra discounts are being offered by some manufacturers in the endeavor to hurry up collections.

Edward Maher's Sons, 216 Berlin street, Newark, N. J., are in the market for a 10-ton electric traveling crane for their foundry yard.

Louis Sacks, Hamburg place and Avenue L, Newark, N. J., is erecting a brick and steel foundry addition to his plant, to be 80 x 125 ft., which will be equipped with a 10-ton electric traveling crane. This extension will permit of the handling of a heavier class of jobbing work than heretofore.

The Biltmore Shirt Company, Albany, has been incorporated to manufacture textile fabrics by Emanuel Raunheim, Adolph Elster and others. A factory will be established.

The Genesee Pure Food Company, Leroy, N. Y., has plans in preparation for the erection of a factory building, 56 x 120 ft., two stories, which will be built soon.

Plans for the construction of a municipal electric lighting plant at Ramsey, N. Y., are being considered by the Borough Council.

The addition to be made to the carpet mill of McCleary, Wallin & Crouse, Amsterdam, N. Y., will be six stories, 90 x 250 ft. Bids for its construction are now being taken. The estimated cost is $225,000.

M. Wile & Co., Buffalo, will build a factory, 70 x 100 ft., two stories and basement, at Guilford and Genesee streets, and equip it with electrically operated machinery for the manufacture of clothing.

The dyehouse to be erected by S. Sanford & Sons, Inc., at Amsterdam, N. Y., is to be 55 x 256 ft. with ell, 55 x 103 ft., five stories and basement, of structural steel and brick. It will cost $200,000. The Carnegie Steel Company, Pittsburgh, has the contract for the structural steel.

The Syracuse Linen Company, Syracuse, N. Y., has been incorporated to manufacture linen fabrics and will equip a plant. George E. Sherer, M. J. Carroll and Allen R. Cowie are the incorporators.

The Lock City Development Company, Lockport, N. Y., has let the contract to the Alexander Shumway & Utz Company, Rochester, for the erection of three reinforced concrete buildings to be occupied by the Stoddard Union Company of Taunton, Mass., manufacturer of plumbers' materials and supplies. The new plant will comprise a foundry and a galvanizing building, each one story; and a machine shop, two stories.

The Buffalo Nipple & Machine Company, Buffalo, has purchased a three-story and basement factory, 60 x 100 ft., at Dupont street and Winslow avenue, and will equip it with pipe cutting and threading machinery for the manufacture of nipples, etc.

The Keyboard Compositor Corporation, Buffalo, has been incorporated with a capital stock of $200,000 to develop and manufacture type-setting appliances. It is expected a manufacturing plant will be established later. A. M. McFarland, K. G. Mowat, R. A. Kellogg and F. F. Baker are the directors.

John W. Gibbs, 100 D. S. Morgan Building, Buffalo, is having plans prepared for a foundry building to be erected at East Delavan avenue and the Erie Railroad.

The Cling Surface Company, Buffalo, manufacturer of belt dressing, etc., is building an addition to its factory at Niagara street and the New York Central Railroad belt line.

The Lockhart-Hodge Company, Buffalo, has been incorporated with $50,000 capital stock and has taken over the Nye Company, manufacturer of the Jones safety guard for woodworking machinery. The new company plans to locate at 12 Waverly street, and to enlarge the output. Cassius A. Lockhart, Helen L. Hodge and Sheldon Hodge are the directors.

The Motor & Mfg. Company, D. Reed president, Dunkirk, N. Y., has let the contract for the erection of a manufacturing plant, 57 x 85 ft., two stories, and 28 x 50 ft., one-story, of brick and stone.

The Afton-Windsor Light Heat & Power Company, Binghamton, N. Y., has made application to the Public Service Commission for permission to issue bonds

for $60,000 and to construct a transmission line to furnish light, heat and power to the towns of Afton, Windsor and Colesville.

C. F. Schupp & Sons, Albany, N. Y., are having plans prepared for a bakery building, 88 x 110 ft., two stories and basement which they will erect and equip.

The board of supervisors, Schenectady, N. Y., is receiving bids for a pumping station and water-storage reservoir for supplying water to the Glenridge Sanitorium at Madison, N. Y.

Bids are being received by the village clerk, Weedsport, N. Y., for the construction of a municipal electric lighting plant.

The Crawford-Cummings Company, Erie, Pa., has been incorporated by John M. Crawford, Parkersburg, W. Va., and Crawford and Edgar C. Cummings, Erie, Pa. The company is capitalized at $25,000 and will engage in the manufacture and sale of engines and machinery. Plans for a plant are underway.

The Wollensak Optical Company, Rochester, N. Y., is receiving bids through its architect, J. Foster Warner, for the construction of a one and two-story factory building, 170 x 200 ft. The estimated cost is $50,000.

The Public Service Commission has granted permission to the Northern Power Company to erect a distributing station at Colton, N. Y., for electric power and lighting service.

The Salisbury Ball Bearing Company, manufacturer of countersunk ball and roller bearings, will remove its plant from Jamestown, N. Y., to Olean, N. Y. Plans are being drawn for the Olean factory and construction work will be commenced early next spring.

Catalogues Wanted

The Cleveland Furnace Company, Rockefeller Building, Cleveland, Ohio, whose file of catalogues was destroyed in the flood of last spring, is desirous of receiving new literature on mill supplies, steam specialities, etc.

New England

BOSTON, MASS., October 21, 1913.

Business continues dull, with some orders, usually for small lots, and some inquiries which have an element of hopefulness. Apparently profits on a given volume of business are decreasing. Collections are slow, which fact is laid at the doors of the banks. Their conservatism, as it has manifested itself for several months, has had few precedents. The result is a restriction of credits which has made itself apparent in the decrease in extensions of manufacturing facilities in New England. Announcements of contemplated additions to shop buildings, or enlargements or replacements of equipment are less numerous than for some years. The money interests are watching keenly the effects of the new tariff and the theoretical effects of the proposed currency bill. Also reported proceedings contemplated against large corporations are creating some lack of confidence.

Bids will be received by L. K. Rourke, commissioner of public works, Boston, Mass., until October 28, for an electric pumping plant for the high pressure fire service.

Providence, R. I., has voted that the water commission be allowed to install a new engine for the pump at the station in South Attleboro.

The town of Paxton, Mass., has voted to establish an electric plant, which will require an engine and electric generator.

The Edison Electric Illuminating Company, which furnishes electric light and power to Bridgewater, Mass., will increase its power plant at East Bridgewater by the installation of a 5000-kw. turbo-electric generator, the improvements to cost $350,000.

The What Cheer Chemical Company, Pawtucket, R. I., will erect a three-story brick building, together with an engine room and boiler house.

The Smedley Company, New Haven, Conn., will erect a brick factory, 40 x 133 ft.

The Sprague Meter Company, Bridgeport, Conn., has awarded the contract for a one-story addition, 40 x 133 ft.

The William B. Jones Granite Company, Barre, Vt., will establish a stone manufacturing plant, which will cost $20,000.

The Holyoke Street Railway Company, Holyoke, Mass., will erect a building to be used as a repair shop and carbarn.

The works of the Cape Ann Tool Company, Gloucester, Mass., have been seriously damaged by fire. It is stated that the plant will be rebuilt.

The additional factory building of the Rubber Regenerating Company, Naugatuck, Conn., will be 55 x 130 ft., three stories, of mill construction.

Announcement is made at Taunton, Mass., that the Lincoln Iron Works, which operates large machine shops, will increase its capacity by the addition of an adjoining property now occupied by the Kinsman & Mills marble finishing plant.

The Fairfield Rubber Company, Fairfield, Conn., will build a one-story addition, 45 x 75 ft.

The National Mfg. Company, Waterbury, Conn., which will manufacture small brass tubing, has awarded the contract for its building, 70 x 100 ft., one story.

Philadelphia

PHILADELPHIA, PA., October 20, 1913.

Dullness in the machine tool and general machinery lines has been more pronounced. Inquiries have been few and for the most part unimportant, buyers apparently awaiting developments in general business. Large undertakings have been to a certain extent held in abeyance, pending the outcome of proposed changes in the banking and currency system. Current demand for tools and machinery has been confined to single small tool purchases, for which business there is sharp competition. Special machinery has been comparatively quiet. The new tariff is having a quieting effect on business in the textile machinery field. Transactions in second-hand machinery have been light. Power equipment, particularly small plants for light manufacturing and small buildings, has been fairly active. Gray-iron castings have been in fair demand. The steel castings business remains quiet.

Bids are now going in on the construction of the proposed new five-story factory building to be erected at 504-516 Locust street for the Haywood Brothers & Wakefield Company. The building will be 80 x 116 ft., of brick and terra cotta. Metal window sash is specified. Stearns & Castor are the architects.

Plans are out for a two-story brick factory building, 55 x 160 ft., to be erected at Forty-eighth street and Parkside avenue, for the General Flooring & Mfg. Company. Webster & Gibson are the engineers.

Revised plans are out for the proposed new office building for the Finance Company of Pennsylvania, on South Penn square. The building has been materially reduced in hight and material changes have, it is stated, been made in the mechanical equipment.

An unconfirmed report states that the Bloch Go-Cart Company, Philadelphia, has acquired a large tract of land at Egg Harbor City, N. J., where it expects to erect a large manufacturing plant in the near future.

Ballinger & Perrot, engineers, have prepared plans and are taking bids for the erection of a four-story brick factory building, 46 x 199 ft., of slow burning construction, to be built at American street and Susquehanna avenue, for Dungan, Hood & Co., Inc.

Biberman Brothers are taking bids for a power plant to be installed in a new building. The equipment includes two 150 hp. boilers, one 150-kw. generating unit, one 150-kw. generator and minor equipment. Sauer & Hahn are the engineers.

Batter, Keely & Faust, textile manufacturers, are taking estimates for the erection of a two-story mill building, 60 x 194 ft., of slow-burning construction, to be erected at Tioga and C streets. E. S. Dyer, Land Title Building, is the engineer and architect.

The Lowell Harness Company, Lancaster, Pa., is about to erect a three-story factory building in that city.

Notwithstanding current reports that William Sellers & Co., Inc., will not begin the construction of its new plant at Folsom, Pa., at an early date, active work of grading and preparing the site for the new buildings which will consist of a foundry and machine shops, is under way.

The property of the Middleby Auto Company, Reading, Pa., will be sold at the company's plant October 30. Included will be the buildings and 478 separate lots of late type high-speed, automatic machine tools and other machinery and mechanical equipment; also a large lot of finished and unfinished parts for the Reading Forty automobile.

The Common Council of New Brunswick, N. J., has voted to adopt the recommendation of the advisory water commission for insuring a pure water supply which involves the building of a force pump in the rear of the power house at Milltown.

The Northwestern Cable Company, New York, is said to be having plans prepared by its own engineers for a new plant to be erected in Camden, N. J., to cost approximately $20,000.

Meyers & Sons, proprietors of the Delaware Sash Weight Foundry Company, Wilmington, Del., are building a 45 x 75-ft. addition to their plant, which will double its capacity. They are doing the work themselves and will finish it early next summer. The addition to the works will be built of brick with steel girders and will have a corrugated iron roof. A new 75-in. cupola will be installed. The total cost will be about $5000.

The Tin Decorating Company, Baltimore, Md., is progressing with the construction of its new plant. It is providing a main building, 275 x 350 ft., four stories, with a total floor area of more than seven acres. The construction is brick and steel, with laminated floors. Steel sash will be used, glazed with ribbed or wired glass. Ovens, dryers, lithographic apparatus, sprinkler system, electric conveyors, etc., will be installed. Theodore Wells Pietsch prepared plans for this building. The company is capitalized at $2,000,000 and employs about 1200 operatives. The power house will have four 250-hp. boilers.

Chicago

CHICAGO, ILL., October 20, 1913.

During the past week interest in machine tools has centered at Chicago, more than 10,000 people visiting the exposition of machinery held at the International Amphitheater in this city. Considering the generally unfavorable business conditions as regards the buying of machinery, sales at the exhibition were surprisingly numerous. Purchases of upright gang drills, high-speed heavy-duty drills, lathes, radial drills and disk grinders were especially prominent. The abundant inquiry of bona fide character which developed during the week is taken as a very favorable indication of good business as soon as buying power is again released.

The Electric Steel Company of Indiana, with offices at 516 Hue-Mansur Building, Indianapolis, recently organized with J. M. Ryan, general manager, will build a foundry for the manufacture of electric steel castings. A 6-ton Buckman arc furnace will be installed, and for the equipment of the foundry a 15-ton electric crane of 50-ft. span, ladles, flasks and sand mill unit will be purchased.

The Loew-Victor Engine Company, Chicago, is having erected a one-story building, 107 x 142 ft., at Oakley and Oakdale avenues which it will lease for the manufacture of marine engines.

The Tonk Mfg. Company, Chicago, has taken out a permit covering the erection of a one and two-story brick factory on Clybourne avenue, at an estimated cost of $10,000.

The C. F. Massey Company, 122 South Michigan avenue, Chicago, manufacturer of battery receptacles and railroad supplies, will erect a 60 x 100 ft. factory at Spokane, Wash., to cost when equipped about $25,000.

Jos. Zidek, Chicago, has completed plans for the erection of a three-story factory on Western avenue, near Fifty-first street, the building to be 120 x 130 ft., and to cost about $65,000.

The Automatic Double Lock Car Coupler Company, Chicago, has been incorporated with a capital of $25,000 by L. LeComte, J. J. Cullen, 1645 West Chicago avenue, and H. Milligan.

The Curtis Fixture Company, Chicago, is preparing plans for a 50 x 50 ft., four-story addition to its machine shop.

The American Metal Weather Strip Company, Chicago, has been organized with a capital of $10,000 to manufacture weather strips and mill work, by David B. Johnson, John T. Frellsen, and Elliott R. Goldsmith, 118 North La Salle street.

The plant of the Malleable Castings Company, Galesburg, Ill., which was recently destroyed by fire, is to be rebuilt within the next month or six weeks.

The Bradley Estate, Peoria, Ill., will build a two-story brick factory building at 601 Franklin street which will be used for the manufacture of lightning rods and is to cost $10,000.

The Chicago, Burlington & Quincy Railroad is planning the erection of new shops at Aurora, Ill., which will cost $400,000.

The Lawrenceville Machine Company, Lawrenceville, Ill., has been incorporated with a capital stock of $20,000 to manufacture and sell oil well supplies, by James Davis, C. W. Guthrie, R. C. Rogers and H. A. Snyder.

The N. O. Nelson Mfg Company, Edwardsville, Ill., manufacturer of plumbing fixtures and soil pipe, will construct an addition to its brass shop, 40 x 60 ft., supported by steel trusses. It will be equipped with brass melting furnaces, etc.

The Agle Artificial Ice Company, Bloomington, Ill., has been incorporated with a capital stock of $100,000 by George Agle, Charles F. Agle and E. B. Hawk.

The Illinois Mausoleum Company, Morris, Ill., has been incorporated with a capital stock of $10,000 by G. A. Leach, B. W. White, Geo. M. Bucklin, W. C. Davis and J. H. Rogers to manufacture burial equipment.

The Newton Broom Company, Newton, Ill., has been incorporated with a capital stock of $25,000 by Ed. Nigh, E. W. Hersh, E. B. Brooks and A. F. Calvin, to manufacture brooms.

The Sterling Dairy Company, Sterling, Ill., has been incorporated with $50,000 capital by Clement, Agram and Ira Hey and will equip a modern plant at once, with creamery machinery, etc.

The Morris Fiber Board Company, Morris, Ill., has been incorporated with a capital stock of $75,000 by Oscar Sumbinsky, C. D. Altick and others, and will equip a plant.

The installation of a waterworks system at a cost of about $8,000 is being planned at Villa Grove, Ill.

The Shapiro-Michaelson Motor Company, Minneapolis, Minn., has been incorporated with a capital stock of $300,000 to build motors, etc., by R. W. Mauel, J. M. Michaelson, Leo Shapiro, of Minneapolis, S. I. Levin and Max P. Shapiro, of Duluth, Minn.

Wellington, Kan., has voted a $240,000 issue of bonds to extend the water plant and to insure a larger and better supply. Engineers have reported favorably on a water supply, two and one-half miles southwest of Mayfield.

Gering, Neb., has voted a $19,500 issue of bonds for the construction of waterworks. O. W. Gardner of Gering, is the engineer in charge.

The Lee Broom & Duster Company, Lincoln, Neb., is engaged in remodeling a part of its factory preparatory to building an addition which will be 50 x 70 ft., two stories.

Esbon, Kan., has voted a $33,000 issue of bonds for the installation of waterworks and an electric light plant.

Davis, S. D., has voted a bond issue for the construction of waterworks.

Advertisements for bids on a preliminary survey and plans for a more adequate water system for Billings, Mont., have been ordered.

Milwaukee

MILWAUKEE, WIS., Oct. 20, 1913.

A few fairly good bookings have been received, but on the whole the situation is hardly satisfactory to the majority of producers. While shops are keeping up a normal production, the market is dragging. Some good new business in special machinery comes in continually, but the placings of large orders are few. The automobile factories form the bulk of the buying contingent. Machine tool makers are crowded at some stages to make deliveries.

The Plankinton Packing Company, Milwaukee, proposes to expend $600,000 in rebuilding its large packing plant in the Menomonee Valley, Milwaukee. H. C. Carr, vice-president and general manager, is in charge.

The Otto L. Twig Company, Sheybogan, Wis., manufacturer of boots and shoes, will build a four-story addition to its present plant and has increased its capital stock from $25,000 to $50,000 for this purpose.

The Gurney Refrigerator Company, Fond du Lac, Wis., is considering plans for greatly increasing its output of ice boxes and refrigerating devices.

A factory for the production of staves, hoops and headings for slack and tight barrel manufacturers will be erected at Athens, Marathon County, Wis., by the Success Stave & Heading Company, which has been organized with $15,000 capital by A. C. Rietrock, of Milwaukee, and William Erbach and William C. Klann, of Athens.

The F. G. Klein Company, Burlington, Wis., has awarded contracts for a two-story addition, 30 x 50 ft., to its bottling plant and will require some additional equipment.

J. A. Pratt, banker, and William C. Leitzke, of Menomonee Falls, have purchased the property of the Menomonee Falls Light & Power Co. for $30,000, and have re-organized it under the title of Menomonee Falls Electric Light & Power Company. The new

owners will rebuild the plant and install new equipment to double the power output and build transmission lines to neighboring cities and villages.

The C. A. Shaler Company, Waupun, Wis., manufacturer of steam and electric vulcanizing devices and electrical specialties, will build a three-story addition to its main factory building and increase its output of portable steam vulcanizing apparatus for garages. Equipment is now being purchased.

The Common Council of Racine has voted an appropriation for the establishment of a municipal machine and repair shop to be installed in the Fourth street engine house. The shop will serve all city departments, but more especially the fire department.

The Loop Nut Company, Milwaukee, has been organized with a capital stock of $25,000 by George H. Owen and Radclif Denniston to manufacture loop nuts and machinists' supplies.

The Augustyn Rotary Valve Engine Company, Marshfield, Wis., has been organized with a capital stock of $10,000 by R. J. Strauss, G. E. Herrington and Henry E. Hoerl, to manufacture a new type of internal combustion motor designed by Mr. Strauss. Plans for the factory and equipment have not been definitely settled upon.

Improvements and extensions will be made by the Rusk Box & Furniture Company, hardwood products, Hawkins, Wis., and to provide funds for the work, the capital stock has been increased from $17,500 to $35,000.

The Jung Brewing Company has changed its plans for a new building at 451 East Water street, Milwaukee, and will erect an eight-story structure for light manufacturing purposes instead of a four-story store and office building. It will cost $75,000.

The Whitney Boiler Works Company, Superior, Wis., a new incorporation, has taken over the National Boiler Works, and will add additional machinery to the plant.

Indianapolis

INDIANAPOLIS, IND., October 20, 1913.

Michael J. Broderick, boiler manufacturer, has been appointed receiver for the Interstate Automobile Company, Muncie, Ind., on petition of its president, who gives the company's indebtedness as over $500,000. The receiver gave bonds for $300,000. He will continue the plant in operation.

The Machinery Clearing House has been organized in this city and incorporated with $10,000 capital stock to deal in machinery. The directors are Sylvester P. Grey, William P. Herod and Herbert G. Parker.

The Miller Machine Company has been incorporated to manufacture and deal in machinery. William H. Miller, Arthur B. Barnard and William A. Scott are the directors.

The New Departure Mfg. Company, Indianapolis, has been incorporated with $5,000 capital stock to manufacture machinery and tools by J. R. Fry, I. A. Phillips and C. E. Phillips.

The B. T. K. Gear & Engine Company, Muncie, Ind., has been incorporated with $100,000 capital stock to manufacture automobiles and accessories by F. M. Boyer, A. Boyer and J. P. Kandel.

A stock company is being organized at Franklin, Ind., with $30,000 to $50,000 capital stock with the assistance of the Commercial Club, to increase the capacity of the Franklin Desk Company, John H. Wooley having arranged to sell his holdings to the new company.

The L. Fischer Company, Whiting, Ind., has been incorporated with $25,000 capital stock to manufacture planing-mill products by G. J. Bader, F. J. Smith and M. Fisher.

The Engine Company of Indiana, Terre Haute, Ind., recently noted as incorporated, has located in a one-story, 40 x 140 ft., brick factory, and plans to produce horizontal single cylinder oil engines of 10, 25 and 60 hp.

The City Council of Mitchell, Ind., has granted A. H. Kennedy a franchise for a waterworks system.

The Muncie Gear Works, Muncie, Ind., has increased its capital stock to $500,000.

The Jacoby-Wiser Company, Elkhart, Ind., has been incorporated with $75,000 capital stock, to manufacture folding beds swings, etc., by A. Jacoby, George L. Wiser and M. E. Jacoby.

The Bastian-Morley Company South Bend., Ind., has been incorporated with $100,000 capital stock to manufacture gas, gasoline and electric apparatus. The directors are James P. Morley, John P. Hayes and J. Morley.

Eli D. Miller & Co., Evansville, Ind., has been incorporated with $50,000 capital stock to manufacture folding beds. The directors are J. C. Johnson, Frank Fuchs and Louis Wollenberger.

The People's Mfg. Company, Greenfield, Ind., has been organized to manufacture refrigerators and similar articles. Frank Cook is president, Marvin Fletcher is secretary and Roland Stuart, treasurer.

Cleveland

CLEVELAND, OHIO, October 20, 1913.

The machinery market continues inactive. Practically no business came out during the week with the exception of scattering single tool orders. Some new projects in the way of new manufacturing plants to displace smaller existing shops have developed and these companies will need additional machinery when they occupy their new quarters. Railroad purchasing is still being held off and very little new machinery equipment is being bought by large metal working shops.

The Cleveland Castings Pattern Company and the Wood & Spencer Company, engineers and makers of machine tools, which are closely affiliated, have arranged for the erection of a new factory building, which they will occupy. The building, which will be erected by the Case School of Applied Science, will be a four-story brick structure, 60 x 100 ft., and will be located at 1930 East Sixty-first street.

The Burr Mfg. Company, Cleveland, will shortly begin the erection of a new plant, the site for which has not yet been decided upon. The company has been reincorporated under its present name with a capitalization of $50,000.

The Cuyahoga Boiler Works Company, Cleveland, has been incorporated with a capitalization of $36,000 to manufacture and deal in boilers. The company will succeed the present partnership that has been conducted under the name of the Cuyahoga Boiler Works, of which John Maher is general manager.

The Exhaust Water Heater Company, Cleveland, has been incorporated with a capital stock of $10,000 by D. S. Bray, G. S. Andrews, J. L. Carroll and others.

The Star Mfg. Company, New Lexington, Ohio, has increased its capitalization from $50,000 to $75,000 to provide increased plant facilities. The company makes feed grinders and mine cars and has lately added the manufacture of blacksmiths' forges.

The Standish Chain & Mfg. Company, Kent, Ohio, is planning the erection of a plant for the manufacture of chain. The company has been at work for some time in developing an automatic machine for the making of chain and has increased its capitalization from $18,000 to $50,000 to provide additional capital to carry on the business.

It is announced that the Concrete Steel Company, Youngstown, Ohio, will erect a shop on a new site near the Ohio works of the Carnegie Steel Company. The building planned is a steel structure, 65 x 250 ft.

Cincinnati

CINCINNATI, OHIO, October 20, 1913.

Business with the machine tool builders continues dull. Improvement is expected in some lines of the export trade, but the majority of machinery manufacturers do not anticipate better demand until after the first of next year. No active lists are out from the railroads and automobile manufacturers are also only purchasing a few replacement tools. The second-hand machinery trade continues to show a slight improvement, and tank and boiler makers are doing better. The foundries are not particularly active.

The electric generating plant to be built by the Columbia Gas & Electric Company, Cincinnati, recently mentioned as contemplated, will be 220 x 270 ft., of brick and steel construction. A. B. Leach & Co., 149 Broadway, New York, will probably award the contract at an early date.

The French Brothers-Bauer Company, Cincinnati, will require refrigerating and other equipment for a large milk and ice cream plant to be located at Plum and Canal streets.

Samuel Hannaford & Sons, Cincinnati, will soon call for bids for the construction of a hospital building at Harrodsburg, Ky., for which lighting equipment will be required.

An unconfirmed report is in circulation that J. F. Dietz & Co., Cincinnati, desk manufacturers, have made arrangements to fit up the idle plant of the Schaacht

Motor Car Company, Winton place, for the manufacture of a general line of office furniture. The Schaacht plant will be sold at an early date.

It is reported that the plant of the J. M. Robinson Mfg. Company, Cincinnati, manufacturer of sheet metal machinery, has been acquired by the W. J. Baker Company, Newport, Ky. The latter company manufactures fly screens and sheet metal specialties. Nothing is yet known as to operating plans.

The Reliable Safe & Lock Company, Covington, Ky., whose incorporation was recently noted, will erect a plant at Fourteenth and Spring streets, to be approximately 50 x 120 ft., two stories, of brick construction. George A. Hattersley, Norwood, Ohio, is one of the incorporators.

The Industrial Club, Covington, Ky., announces that the Covington Drillhead Works will soon locate a plant at Fifth and Scott streets. No machinery requirement details are available.

The Swan Under-Reamer Company, Marietta, Ohio, is constructing a plant at Third and Church streets, that will be fitted up for the manufacture of a patented machine shop tool. Considerable machinery equipment will be required. Dr. John C. Swan is president.

The Shartle Brothers Machine Company, Middletown, Ohio, will make a two-story addition to its plant at an early date. The proposed structure will be of brick and concrete, and is estimated to cost about $10,000.

Detroit

DETROIT, MICH., October 20, 1913.

No improvement is noted in the local machinery market and sales have been few. Reports received from Grand Rapids indicate that the market in western Michigan is likewise lethargic. Inquiry is not plentiful and dealers see nothing to indicate that the general dullness will be relieved in the near future. The automobile industry is the barometer of activity in this locality and the fact that many companies are laying off men is not encouraging. Second-hand machinery is moving slowly. Some business in sawmill equipment is reported and several installations of electrical equipment by municipal plants have helped to keep this class of machinery moving fairly well. No change is noted in the foundry trade. A slowing down in building operations is noticeable.

The Universal Machine Mfg. Company, Detroit, has completed its new plant and will remove its business from Philadelphia to this city. The building is two stories, 56 x 126 ft., and is modernly equipped. The company specializes in bottle washing machines and is capitalized at $100,000.

The Henderson Motorcycle Company, Detroit, has increased its capital stock from $175,000 to $275,000.

Kaiser & Schmidt, Detroit, have awarded the contract for the erection of two brew houses of steel and concrete construction, one four stories and one five stories.

The Detroit Cyclecar Company, Detroit, has been incorporated with $250,000 capital stock and will engage in the manufacture of cycle cars, by Arthur R. Thomas, Frederick L. Hall and Phillip H. Cale.

Fire damaged the enamelling department of the Detroit Auto Specialty Company's plant to the extent of $5,000 October 12. Damage to the equipment was slight.

The Motor Products Company, Chelsea, Mich., has been incorporated with $100,000 capital stock by M. Falter, B. V. Howard and D. W. Caswell. The company has taken over the former plant of the Flanders Mfg. Company and will engage in the manufacture of motorcycles. Executive offices will be established at Detroit.

The Business Men's Association, Mt. Clemens, Mich., has completed negotiations for the establishment of a pottery plant in that city. The operating company will be capitalized at $150,000 and it is stated that contracts for the factory will soon be awarded.

The American Stone Company, Lansing, Mich., has completed arrangements for the erection of a factory for the manufacture of rubbing and polishing bricks and related articles.

The taxpayers of Dearborn, Mich., have voted to bond for $22,000 for the installation of a waterworks system.

Fenton, Mich., has voted a lighting f anchise to the Flint Electric Company. The company promises to erect a new power house and install additional equipment.

The Lyons Machine & Mfg. Company, Muskegon Mich., has increased its capital stock from $30,000 to $50,000.

The Bay City Dredge Works successors to the Bay City Tool & Machine Company, Bay City, Mich., has broken ground for a new building to be used as a machine shop and foundry for the manufacture of the Bay City dredge.

The Invisible Door Check Company, Niles, Mich., has broken ground for its first factory unit, 60 x 160 ft., of brick and concrete construction. The company plans the erection of additional buildings which will be used for the manufacture of its invisible door check.

Wheeling

WHEELING, W. VA., October 20, 1913.

The work of building the plant of the Ohio Tool Company at Charleston, W. Va., has been completed. The plant has four main buildings as follows: One, 50 x 150 ft., three stories; one, 50 x 140 ft., two stories; one, 46 x 209 ft., one story. The engine has arrived and other machinery is being installed. The plant will manufacture carpenters' tools and other implements. William E. Jones is president of the company.

The buildings for the new plant of the Parkersburg Rig & Reel Company at Parkersburg, W. Va., are nearing completion and officials of the company expect to have the plant in operation by January 1.

The Moundsville Wall & Plaster Company, Moundsville, W. Va., has been incorporated with a capital stock of $25,000 by William Fisher, J. W. Peters, G. F. Searls and others.

The Wilhurst Oil Company, of Fairmont, W. Va., has been incorporated with $25,000 capital stock by J. P. Michaels, L. Gillett, J. F. Phillips and others of Fairmont, W. Va.

The Baldwin Steel Company, Charleston, W. Va., has been reorganized. Antone Boerder was elected president and Charles Capito secretary and treasurer. The plant is in shape to start at once.

The Templeton Coal Company, Clarksburg, W. Va., has been incorporated with $25,000 capital stock by J. M. Quinn, J. Hay Quinn and others, of Clarksburg, W. Va.

The Central South

LOUISVILLE, KY., October 20, 1913.

Business appears to be showing some improvement, although general complaint is heard of tight money and slow collections, features which usually have a retarding influence on sales. Business in the far South is reported by manufacturers to be better than trade in the Central South and the Ohio Valley, a condition which is probably due to the fact that less manufacturing is done in the former district and consequently less adverse influence is operating from the tariff changes. Boiler demand is excellent, being one of the encouraging features of the situation. Machine tools are also in fair call.

The Louisville Water Company, which opened bids October 7 on two 400-hp. water-tube boilers, has announced that it will readvertise for bids. The exact date of closing has not been determined. Theodore Leisen is chief engineer of the company.

The Kentucky Distilleries & Warehouse Company, Louisville, which is completing the construction of a new power plant for its Elk Run distillery, the largest in the State, has placed an order for four water-tube boilers, involving an aggregate of 1820 hp., with the Heine Safety Boiler Company, St. Louis. This is the largest order placed locally this year, and there was considerable competition for the business.

The Henry Vogt Machine Company, Louisville, has ordered a No. 5 bar shear, taking billets up to 4 in. square, from the Hilles & Jones Company, Wilmington, Del. The tool will be installed in the drop forging department.

Major J. C. Oakes, United States Engineers, Louisville, will receive bids until November 8 for three floating pile drivers, among other equipment. He will open bids November 10 on two steel derrick boats.

The Rugby Distilling Company, Thirty-sixth street and Missouri avenue, Louisville, has plans for a new bottling house. Motor-driven conveyors and automatic bottle-filling equipment will be needed.

The Falls City Construction Company, Realty Building, Louisville, has the contract for the construction of a plant for the Grayson Springs Hotel Company, Grayson Springs, Ky. The proposition is an unusually am-

bitious one, and the entire hotel and equipment will cost $400,000, of which $50,000 will be spent for machinery. The construction company will build and equip an electric light and power plant, refrigerating plant, etc., and will install two passenger and one freight elevator. Plans for the building are now being drawn and will be completed in about 50 days.

The distillery of Joseph Meador, Allen County, Ky., was recently burned. He has decided to rebuild.

The Victoria Coal Company, Earlington, Ky., has decided to open a new coal mine, and will be in the market for equipment in the near future. The new operation will be near Madisonville, Ky.

The planing mill of Augustus Snyder, Louisa, Ky., was burned last week with a loss of $5000. Decision as to rebuilding has not yet been made.

Kennard Ragon, Jackson, Ky., manager of the Kentucky Wood Products Company, is preparing to install a plant for the manufacture of wood alcohol from sawmill refuse. He is now purchasing equipment.

J. R. Hoe & Sons, Middlesboro, Ky., are building an addition to their foundry and machine shop. Several new machine tools will be required, besides increased foundry equipment.

The Burley Tobacco Company, Lexington, Ky., has decided to operate a loose leaf warehouse at Harrodsburg, Ky. Considerable equipment will be needed.

The Wadsworth Stone & Paving Company, Bowling Green, Ky., is to install a traveling crane for handling asphalt and stone. The cost of the equipment will be $10,000.

The Selby Shoe Company, Portsmouth, Ohio, has definitely decided on the erection of a new factory at Ashland, Ky., and plans for the building are now being drawn. George R. Selby may be addressed.

S. Renaker & Sons, Winchester, Ky., have decided to install a cold storage plant in connection with their produce business. Their building was recently burned.

The pumping equipment of the Magnesia Spring Water Company, Lagrange, Ky., has been destroyed by fire. The machinery will be replaced.

The Louisa Canning Company's plant at Louisa, Ky., which was recently burned with a loss of about $5000 on the equipment, will be replaced, as will also the Louisia planing mill under the same ownership.

Jos. Eley's flour mill at Sharp, near Benton, Ky., is reported burned with a loss of $10,000 on equipment. It will be replaced.

The cotton gin of J. H. McCall at Westport, Tenn., recently burned with heavy loss, will be replaced.

The Simplicity Shade Adjuster Company, Memphis, Tenn., will install additional machinery at a cost of about $5000.

The Sip Bottling Corporation, Nashville, Tenn., is to build a plant in that city at a cost of $25,000. Sam R. Corbett is vice-president and general manager.

The Chester Motor Car Company, Nashville, Tenn., has begun the construction of a garage, and will probably be in the market for machine tools for its repair shop.

The Beare Bros. Ice Company, Jackson, Tenn., will begin the construction of an addition to its factory shortly and will be in the market for some machinery.

Winnsboro, S. C., has voted a $65,000 issue of bonds for waterworks and sewerage.

Camden, S. C., has sold a $125,000 issue of municipal light and water plant bonds. The electric light plant will require $35,000 of this amount.

St. Louis

ST. LOUIS, MO., October 20, 1913.

Machine tool demand in this market is not developing rapidly, the feeling of conservatism which prevails elsewhere being apparent here. However, the commercial situation is of an encouraging character, as all industries are satisfactorily busy, with stocks well cleaned up and raw material supplies in such shape that there is no complaint as to carrying charges. Under such conditions as these, with the agricultural districts showing up well financially, as indicated by the bank reports, it is believed that there will be sufficient financial foundation for extension work as soon as the currency uncertainties are settled.

The Chicago, Peoria & St. Louis Railroad will build a freighthouse on the east side of the river at this point, with some mechanical equipment for handling freight.

The Simmons Mfg. Company, St. Louis, manufacturer of beds and other furniture, has completed plans for the construction and equipment of a four-story building, to which it will remove as soon as completed. With equipment about $100,000 will be invested.

The Reliance Buggy Company, St. Louis, has been incorporated with a capital stock of $200,000 by Frank W. Edlin, P. E. Ebrenz and Alpha T. Stevens, to manufacture automobiles, buggies, trucks, etc.

The Middagh-Collins Covering Company, St. Louis, has taken out a permit to increase its capital from $10,000 to $20,000 for the purpose of increasing its equipment for the manufacture and placing of roofing material.

The Missouri Electrical Company, St. Louis, with a capital stock of $12,000, has been incorporated by Lester J. Harris, G. L. Gamp and Arthur C. Eckert, to equip an electrical manufacturing and apparatus repair shop.

The John Berry Automobile Company, St. Louis, has increased its capital for the purpose of adding about $10,000 of equipment in its garage and repair plant.

Crocker Bros. have plans for the equipment of a packing plant to contain about $10,000 of machinery at Webb City, Mo.

The Plantation Equipment Company, Valley Park, Mo., recently reported incorporated, is now in the market for equipment for future needs for the manufacture of motor propelled agricultural machinery. It will be some time next year before active work on the plant equipment is undertaken. Machine shop, forge shop and pressed steel equipment is included.

The American Lithuanian Knitting Company, Kenosha, Wis., has plans for the equipment of a mill at Joplin, Mo.

J. Bickley and others at Murfreesboro, Ark., have obtained a franchise for an electric light and power plant, and are in the market for the necessary equipment.

A cold storage plant addition, to cost with equipment about $75,000, will be built at Texarkana, Ark., by Swift & Co., Chicago, Ill.

A plant for the manufacture of book cases, china closets, etc., will be established at Little Rock, Ark., by F. R. Slimmer, of F. R. Slimmer & Co., Chicago, Ill.

An ice manufacturing plant at Murfreesboro, Ark., is under consideration by J. Bickley, who is reported in the market for the machinery.

The Murfreesboro Brick & Tile Works, Murfreesboro, Ark., intends to install $5000 brick and tile manufacturing equipment, and will equip for pottery manufacture a little later. Matthew Wickham is manager.

The city of Supply, Okla., has completed the formal issue of $10,000 in bonds to be expended for a waterworks plant under the direction of C. C. Devoe, chairman of the board of commissioners.

The Tulsa Foundry & Mfg. Company, Tulsa, Okla., has been incorporated with a capital stock of $15,000 by I. V. Gray and R. W. Page, of that city, and H. L. Eastman, of Muskogee, Okla.

The Griffin Lumber Company, Homestead, Okla., has been incorporated with a capital stock of $10,000 by H. W. and Z. Griffin, of Braggs, Okla., and I. Christie, of Cleo, Okla., and will equip a mill.

The Southwestern Granite Company, Oklahoma City, Okla., recently noted incorporated with $100,000 capital, will develop 40 acres of granite quarry, and is reported in the market for considerable equipment. H. Pickford, Washington, D. C., is president, and J. F. McGee, Washington, D. C., vice-president.

A waterworks plant to cost about $10,000 will be equipped at Elk City, Okla., under the direction of the city officers, the funds having been provided through bonds.

E. B. Martin will equip a veneer and woodworking plant at Pascagoula, Miss., having bought a site with buildings, and now being in the market for the necessary equipment.

The Great Southern Lumber Company, Bogalusa, La., will add sufficient equipment to its mill for an increase in its production from 700,000 to 1,500,000 ft. daily.

The Fidelity Land Company, of Dalcour, La., with offices at No. 705 Gravier street, New Orleans, La., will equip a pumping plant with a capacity of 20,000 gal. per hour, together with necessary auxiliary equipment. Ernest J. Coulon, president.

The plant of the Hurricane Creek Lumber Company, at Guy, La., is reported burned, with a loss of $12,000 on equipment, which is to be replaced.

The New Orleans Metal & Roofing Works, of New Orleans, La., is in the market for additional equipment for its plant, including a shear for cutting corrugated sheets.

Birmingham

BIRMINGHAM, ALA., October 20, 1913.

Machinery dealers report a lighter business than in the two weeks preceding. However, the general demand is good and there is a heavy business in power machinery. Small sized boilers have been selling freely, and the demand for appliances connected with electric apparatus has been satisfactory.

The Farmers Fertilizer Company, Hurtsboro, Ala., will establish a fertilizer mixing plant at a cost of $10,000.

The McComb's Ginnery, at Oxford, Ala., was burned with a loss of $5000, covered by insurance.

The ginnery and sawmill plant of C. E. Helms & Son, near Gadsden, Ala., were wrecked by a boiler explosion.

The Centerville Lumber Company, Centerville, Ala., has been incorporated. A. N. Belcher is president. A lumber cutting plant will be established.

The Bibb County Cotton Oil Company, Centerville, Ala., has been incorporated, with a capital stock of $30,000. J. W. Thompson and others are interested.

S. T. Tygrat will establish a fertilizer mixing plant at Nashville, Ga.

The city of Fort Gaines, Ga., will establish an electric lighting plant, an $8000 issue of bonds having been voted for that purpose.

The Riverside Mfg. Company, Moultrie, Ga., will rebuild the mattress factory which was recently burned with a loss of $20,000. W. J. Vereer is president.

The Southern Tire & Rubber Company will soon begin construction of a rubber tire factory at Macon, Ga. H. Dech, Trenton, N. J., will be the manager. W. A. Smith is president.

T. C Duren, Thomasville, Ga., is equipping an automobile repair shop, and is in the market for machine tools.

The Florida Show Case Company, Tallahassee, Fla., has been incorporated with a capital stock of $15,000 by C. A. Shoemaker, W. H. Rugeley, W. B. McCauley and A. L. Messer, of Tallahassee, and J. C. Upchurch, of Capitola, Fla.

The Southern Ice & Power Company, Fort Meade, Fla., has been incorporated with a capital stock of $50,000 by A. H. De Vane and R. H. Pope, of Fort Meade, and A. B. Hull, Jr., of Winter Haven.

The Southern Utilities Company, Jacksonville, Fla., is considering the establishment of an electric lighting plant at Riverview, Fla.

The Lawrence Mfg. Company, Key West, Fla., will establish a plant for the manufacture of stuffing box and combination lock valves at Punta Gorda, Fla.

St. Petersburg, Fla., has voted a $41,000 bond issue for waterworks.

Texas

AUSTIN, TEXAS, October 18, 1913.

The machinery and tool trade the past week has been comparatively dull. An increase in the demand for irrigation pumping machinery is looked for in the coming winter months, as many projects of this character are on foot. The recent flood damage in the State proved not to have been as great as was originally thought.

The Cuero Light & Power Company has been granted a 50-year franchise by the City Council and is planning to build a new dam and power house several miles below the present dam to afford more power. A large steam plant to be used in emergencies is also under consideration.

A grist mill and elevator, the latter to have a capacity of 20,000 bushels, are to be erected at Bishop.

The City Council of Willis has issued $7500 waterworks bonds and work will begin on the construction of a waterworks plant and distributing system at once.

The Chamber of Commerce of Temple is assisting in promoting the construction of a natural gas pipe line between Mexia and Temple via Marlin and the construction of a distributing system. Distributing systems will also be installed at Marlin, Groesbeck, Thorndale, Lott and other smaller places through which the proposed line will pass.

The City Commission of Waco has granted a franchise to G. W. Stough, of Kansas City, Mo., A. E. Wilder, of Mexia, Texas, and associates, for the construction of a natural gas distributing system at Waco. The gas will be piped from Mexia. Work on the pipe line will be started at once.

The Pioneer Natural Gas Company will construct a pipe line from its natural gas wells near Moran to the town of Biard, via Cisco and Putman, for the purpose of supplying these places with the fuel. The company has also obtained right of way for a line to Clyde and Abilene.

The Garza Gin Company, Garza, has been organized for the purpose of erecting a cotton gin.

The waterworks commissioner of Fort Worth has requested an appropriation of $64,250 from the city commissioners for the purpose of overhauling a number of the city's pumping plants, etc. The machinery needed is an air compressor, estimated to cost $20,000.

The Marfa Light & Ice Company is remodeling its electric light plant and power system.

An ice factory is to be constructed at Fort Bliss by the United States Government.

The Cheek & Hyeman Lumber Company, Houston, Tex., has acquired the property of the Houston-Liggett Lumber Company and plans the erection of a new plant for the manufacture of oil and wine barrels. New machinery will be installed.

The Pacific Coast

SAN FRANCISCO, October 16, 1913.

Machine tool merchants are still waiting for the letting of orders for the navy repair ship. No other inquiries of importance have come out of late, and business, even of a small nature, is below expectations. Some country buyers are still in the market, but many of the automobile shops from which considerable business was expected are getting second-hand tools from Eastern factories. A tendency is also noted on the part of the larger machine shops to send buyers east when the purchase of new tools is contemplated, though it is at least doubtful whether they can do any better in regard to prices there than in the local market. At present few local shops are working at capacity, and prospects for the remainder of the year are not especially encouraging. The general machinery market also remains quiet, as conditions in various manufacturing industries are unsettled. Operating costs in many lines have increased within the last year, and manufacturers hesitate to increase their equipment until there is better assurance of profits. The lumber business is still depressed, and most manufacturers are keeping out of the market, while the local planing mills are buying practically nothing. Some lines, however, are receiving a fair amount of attention. Pumping machinery continues in demand, not only in the interior of California but all through the Southwest. Local gas engine manufacturers report a satisfactory export business. Australia and New Zealand have been the largest buyers in the past, but several agencies have lately been placed in the Orient, which offers a promising field. One local firm has just appointed an agent in Buenos Ayres. Considerable business is in prospect in ice and refrigerating machinery, new plants being planned in various interior towns.

The Southern Pacific Company is taking figures on a traveling crane for its local freight yard.

The San Francisco city engineer is preparing specifications for additional cars for the municipal railroad, and for boilers, engines and mechanical equipment for the new city hall.

Sacramento, Cal., plans to put in an elaborate high school manual training equipment, including a machine shop and machinery for various lines of instruction.

Building plans have been completed for a new factory for the Homer Motors Company on San Fernando road, Los Angeles. The plant will include a foundry and machine shop for the manufacture of traction engines and motor trucks.

The Union Iron Works has purchased the steamer Iaqua, which will be converted into a salvage vessel. Powerful pumping and hoisting machinery and a wireless outfit will be installed. This will be the second regular seagoing salvage steamer at this port.

The City Iron Works, Long Beach, Cal., has purchased a site in the new industrial district for foundry purposes.

The Duplex Distillate Carburetor Company has been incorporated at Santa Ana, Cal., with a capital stock of $50,000, by H. H. Kelly, J. C. Metzger and others, for the manufacture of a patent carburetor handling low-grade oil.

The Yolo Water & Power Company is preparing to build a large dredge for reclamation purposes near Lakeport, Cal.

It is announced that the Warman Steel Company, Redondo Beach, Cal., will install an electric furnace at a cost of $10,000.

E. L. Stanfield is putting in a small machine shop at Barstow, Cal.

Eastern Canada

TORONTO, ONT., Oct. 20, 1913.

The American Road Machinery Company, Goderich, Ont., will shortly erect an addition to its factory, 70 x 100 ft.

The Laurentide Company, Ltd., Grand Mere, Que., is planning the installation of additional paper machines.

A. M. Baynes and P. D. Davidson, formerly of the National Canners Company, Hamilton, Ont., have formed the Hamilton Preserving Company. They have opened a factory at 119-121 Elgin street and will put up a larger plant in the spring of 1914.

Work has been started on the new Canadian Northern Railway shops at Rideau Junction, Ont. It is expected that they will be finished next spring. At first about 3000 men will be employed in the new works.

The Peerless Motor Company, Ltd., whose factory and offices are in Birmingham, England, has recently opened offices in Montreal. J. F. Evans has been appointed general manager and James Warren managing director. A Canadian company is to be organized with a capital stock of $500,000 and will erect a large factory on the outskirts of Montreal.

Fire destroyed the planing mill at Ontario and Sydenham streets, Toronto, owned by George Scholey, with a loss of $10,000.

The Wayne Oil Tank & Pump Company will locate a branch factory at Woodstock, Ont.

The Parry Sound Basket & Veneer Company, Ltd., Stony Creek, Ont., has been incorporated with a capital stock of $60,000 by S. D. Biggar, F. F. Treleaven and others, to manufacture boxes, crates, etc.

The Kir-Benn, Ltd., Almonte, Ont., has been incorporated with a capital stock of $200,000 by A. M. Greig, W. H. Stafford and others, to manufacture stoves and furnaces.

The Berkel-Freeman Slicing Machine Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of $40,000 by S. S. Mills, William Bain and others, to manufacture slicing and cutting machines.

The Electric Mfg. Company of Canada, Ltd., Montreal, has been incorporated with a capital stock of $2,000,000 by Howard S. Ross, E. R. Angers and others, to install electric plants and build machinery.

The Merchants Mutual Lake Line, Ltd., Toronto, has been incorporated with a capital stock of $1,500,000 by J. S. Lovell, C. D. Magee and others, to build ships, drydocks, etc.

The Model Dairies, Ltd., Montreal, has been incorporated with a capital stock of $1,000,000 by L. Macfarlane, C. A. Pope and others, to manufacture cold storage machinery.

The C. A. Chilver Company, Ltd., Walkerville, Ont., has been incorporated with a capital stock of $40,000 by C. A. Chilver, J. R. Ridley and others, to manufacture builders' supplies.

The Canadian Automatic Parcel Checking Company, Ltd., Toronto, has been incorporated with a capital stock of $200,000 by M. H. Ballou, J. J. Williams and others, to manufacture cabinets, safety deposit boxes and vaults.

Hamilton Taxicabs & Garage, Ltd., Hamilton, Ont., has been incorporated with a capital stock of $40,000 by D. M. Sorenson, H. J. Davison and others, to manufacture and repair motor vehicles.

The Wallaceburg Oil Refining Company, Ltd., Chatham, Ont., has been incorporated with a capital stock of $200,000 by D. A. Gordon, R. G. Stitt and others, to manufacture and refine petroleum, etc.

The Patent Twines, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by A. L. Malone, E. G. Long and others, to manufacture twine, rope, etc.

Western Canada

WINNIPEG, MAN., October 18, 1913.

The volume of trade is not large, but the outlook is good. As the season advances prospects of activity in the spring becomes steadily brighter. It is expected that various Western municipalities will be liberal purchasers of machinery for municipal work next season, postponed on account of the financial stringency. The successful crop this year and the great amount of fall plowing done have greatly stimulated confidence in the future. Trade in machinery parts at present is quite satisfactory, being of about the same volume as at the corresponding date last year.

An agreement has been reached between the City Council of Prince Albert, Sask., and the Royal Farm Machinery Company, Winnipeg, whereby the company has been granted a ten-acre site on which to build a manufacturing plant in Prince Albert at a cost of $100,000.

The Council of Kildonan, a suburb of Winnipeg, is considering the question of installing waterworks and sewerage system.

Premier A. L. Sifton, of Alberta, announced this week that 50 more co-operative elevators would be erected next year in that province. The legislature will soon be asked to appropriate funds for the purpose.

The Arnett Furniture Company, Ltd., Souris, Man., is preparing to increase the capacity of the plant. The necessary capital is being raised and work will likely start early next spring.

The British Columbia Pottery Company, Ltd., Victoria, B. C., is contemplating the construction of a pottery plant at a cost of $100,000.

J. L. Hamilton and J. Fraser, Smithers, B. C., have selected a site on which they will erect an electric light plant and waterworks.

The Great West Textile Company, recently incorporated, is locating a plant at Saskatoon, Sask. Address A. W. Ford, Regina, Sask.

It is announced that H. A. Bonnar, 99 Farnham avenue, Toronto, and others are planning a large knitting plant at Red Cliffe, Alberta. Although no plans have been publicly announced, orders are being given for machinery and equipment.

A building permit has been issued for the construction of a brewery by the Medicine Hat Brewing Company, Medicine Hat, Alberta, on its site in the manufacturing section east of the rolling mills. The plant will consist of a two-story brick building, 106 x 150 ft., and will cost $10,000. The work will be in charge of V. C. Drazan, of Palouse, Wash.

Government Purchases

WASHINGTON, D. C., October 16, 1913.

Bids will be received by the New York depot, quartermaster corps, Army Building, New York, under schedule 475, until November 3, for a gasoline engine. No particulars are given.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until November 4, under schedule 5943, for steel plate fans for Brooklyn.

Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, until December 6, for a coaling tower and alterations and improvements to the coaling plant, for the navy yard at Boston. The amount available is $65,000.

Bids will be received by the United States Engineer Office, Chicago, Ill., until November 9, for machinery for the dipper dredge Illinois.

Bids will be received by the paymaster-general of the navy, Washington, D. C., until October 28 for furnishing the following supplies:

Schedule 5924—Steam Engineering.

Class 82, Boston—One electric heated oil tempering bath.
Class 83, Boston—One single-frame self-contained tool-dressing hammer.
Class 84, Boston—One belt-driven universal grinding machine.
Class 85, Boston—One cutter and tool grinder.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, on October 14 for supplies for navy yards as follows:

Schedule 5861—Ordnance.

Class 61, Newport—One full universal radial drill—Chandler & Farquhar Company, $1638; Manning, Maxwell & Moore, $1300; Niles-Bement-Pond Company, $1115; William E. Williams, $1326.

Schedule 5862—Construction and Repair.

Class 71, Boston—Electrically operated deck winches—American Engineering Company, $2462.50; Lidgerwood Mfg. Company, $3000.

Schedule 5863—Steam Engineering.

Class 81, Pumps to be delivered as follows: Two sets at Boston, four sets at Brooklyn and four sets at Norfolk—Blackall & Baldwin Company, $26,420; De Laval Steam Turbine Company, $24,240, $23,590 and $23,490; Platt Iron Works Company, $31,072; C. H. Wheeler Mfg. Company, $39,100; A. L. Worthington, $32,250; William E. Williams, $32,790.

Schedule 5876—Construction and Repair.

Class 111, Installing a sawdust and shavings collecting outfit at the navy yard, Portsmouth, N. H.—Allington & Curtis Mfg. Company, $900.

Schedule 5878—Construction and Repair.

Class 113, Brooklyn—Two 3-motor electric traveling wall cranes—Brown Hoisting Machinery Company, $2162.50; Niles-Bement-Pond Company, $1930.

Trade Publications

Automatic Hoisting Machinery.—Otis Elevator Company, Eleventh avenue and Twenty-sixth street, New York City. Treats of double-drum hoisting machinery operated by direct and alternating current and also by steam, designed for blast furnaces, limestone plants and for other heavy loads where full automatic control is required. A universal stop motion switch, having individual and collective adjustments and a full automatic hoist controller is supplied to the electrically operated machines. Emergency brakes are also part of the equipment. A direct-current, double-screw, internal geared electric bell hoist with a full automatic controller for heavy blast furnace service is also illustrated.

Wire Machines.—Sleeper & Hartley, Worcester, Mass. Bulletins Nos. 270, 272, and 275. Treat of the company's torsion spring machine and wire flattening mill. The torsion spring machine, which was illustrated in *The Iron Age*, June 12, 1913, takes the wire from a coil, feeding, cutting and coiling it automatically. Spring forms may be wound either right or left hand, having any desired number of coils. The wire flattening mill is designed for flattening small wires used in staple making, etc. The rolls are made of fine tool steel, having been ground and adjusted in parallel. The construction of the reel permits the coil of flattened wire to be tied before removal.

Revolving Portable Elevator.—New York Revolving Portable Elevator Company, Jersey City, N. J. Bulletin No. 24. Calls attention to the advantages of a portable elevator with a revolving base. Among other features is the hinging of the elevator, so that it can be folded for passing under low doors or placing on a hoist. Various installations are illustrated. Attention is called to non-revolving machines which the company also manufacture An illustrated description of the revolving elevator appeared in *The Iron Age*, January 2, 1913.

Woodworking Machinery.—Newman Machine Company, Greensboro, N. C. Booklet. Contains illustrations without description of part of the company's line of woodworking machinery. The booklet is designed for pocket use and calls attention to large descriptive circulars of the machines illustrated.

Boiler Tube Cleaners.—Lagonda Mfg. Company, Springfield, Ohio. Bulletins X and Y. The first describes a new type of water-driven boiler tube cleaner with tapered roller bearings instead of the usual thrust type. It is equipped with a repair head, toggle joint and drill heads for heavy or hard scale. Attention is called to the wide separation of the two sets of roller bearings, which is designed to assure continued alignment. Bulletin Y illustrates an air-driven cleaner. An adjustable air admission port by which the size of the air opening can be adjusted to meet the different air pressure conditions is used. It is fitted with a repair head. The cleaners of both types are built for different sizes of tubes. An illustrated description of the air-driven cleaner appeared in *The Iron Age*, May 23, 1911.

Patternmakers' Disk Grinding Machine.—Charles H. Besly & Co., 118 North Clinton street, Chicago, Ill. Circular. Illustrates a 30-in. patternmakers' disk grinding machine which, it is claimed, enables an apprentice boy to turn out high-grade work. A feature of the circular is the illustration and brief description of a few of the labor saving operations which can be performed on this machine by the use of various attachments.

Core Ovens.—Quigley Furnace & Foundry Company, Springfield, Mass. Bulletin No. 2. Describes a continuous revolving shelf or reel type of core oven, burning coal, coke, oil or gas fuel, and designed for handling and properly baking small and medium sized cores. A number of views of the oven in use are given, together with a sectional elevation showing the arrangement of the different shelves. Mention is also made of core and mold drying ovens with rolling doors.

Bench Drilling Machines.—Peerless Drill Company, Rockford, Ill. Folder. Shows a line of bench drilling machines, which are made in the plain and ball bearing types. Brief descriptions of the two tools, with a condensed table of specifications are given. An illustrated description of the ball bearing machine appeared in *The Iron Age*, September 11, 1913.

Conveying and Power Transmission Machinery.—Link-Belt Company, Philadelphia, Pa. Books Nos. 120 and 126. The first is concerned with the Peck carrier for coal, coke, ashes, cement, stone, ore and other materials. The advantages of this conveyor, which is of the gravity bucket type, are touched upon, followed by a description of it, with a number of illustrations of the various parts. A considerable portion of the book is given over to illustrations of various installations, together with drawings showing the arrangement. Mention is made of accessories, such as feeders, crushers, track hoppers, coal bins, ash pockets, stoker spouts, gates, cars, cranes, unloaders, telphers, etc. The second book, which supersedes the power transmission machinery section of catalogue No. 90, contains illustrations with brief text descriptions and dimension tables of power transmission appliances, such as couplings and safety collars, pillow blocks, shafting hangers, etc.

Steam Specialties.—Wright Mfg. Company, Detroit, Mich. Catalogue No. 12. Lists a line of steam specialties which includes traps, safety alarm water columns, exhaust heads, filters, air traps, etc. All of these are illustrated and described, with both halftone engravings and line drawings to show the arrangement of the various parts. Tables of dimensions are included.

Electric Motors, Fans and Buffing and Grinding Machines.—Mechanical Appliance Company, Milwaukee, Wis. Five booklets. Point out the advantages of the Watson multipolar motors, which are made in a number of different styles for driving ventilating fans, buffing and grinding machines and various other pieces of machinery to which motor drive can be applied. Views of the motors, their various parts and as applied to the different machines are included.

Boiler Feed Regulator.—Murray Specialty Mfg. Company, 55 Woodbridge street, Detroit, Mich. Gives general description and specifications for an automatic boiler feed regulator, which is designed to maintain the water in the boiler at the center gauge automatically, furnish dry steam to the engine, prevent accidents due to low water and eliminate waste of fuel. Mention is also made of a number of other specialties, such as steam traps, pump governors, blow-off valves and a safety alarm water column. A number of useful hints to engineers and a partial list of users of the boiler feed regulator are included.

Electric Protective Devices.—Metropolitan Engineering Company, 1238 Atlantic avenue, Brooklyn, N. Y. Collection of bulletins. Call attention to the various types of protective devices which this company is manufacturing under the Murray patents. These devices cover practically the entire field of interior, line and subway construction and safety is obtained by completely inclosing the electrical circuit by porcelain or metal, and as a further precaution, the circuit cannot be established unless all of the contacts are inclosed in porcelain.

Turret Lathe Operation.—Gisholt Machine Company, Madison, Wis. Loose leaf circular. Calls attention to two operations that can be advantageously performed in a turret lathe. One of these is the cutting of a continuous thread in a pipe coupling, which is performed in two operations. The first operation consists of facing and counterboring the end of the coupling, which can be done with the machine set for the second operation. After the facing has been completed, the hole is rough bored to the diameter of the smallest part, after which the turret is shifted and the boring of the hole to the required taper completed. The final step in the process is the chasing of the thread, which is accomplished by shifting the turret a second time. A diagram showing the arrangement of the various parts of the lathe for the performing of this operation is given. On the other side of the circular a 34-in. turret lathe is shown finishing gas engine flywheels. When doing this work a flywheel 21½ in. in diameter, with a 1 1/16-in. face, and a bore of 1½ x 3⅛ in. was finished in the average time of 50 sec.

Steel Sash.—Trussed Concrete Steel Company, Detroit, Mich. Handbook. Shows the complete line of United steel sash, including all types of sash for every condition of daylighting and ventilation. Among the various styles of sash listed are the standard pivoted sash, the center pivoted and top hung continuous sash, and the counterbalanced, spring counterbalanced, and lead and cast-iron counterweighted vertical sliding sash. There are a number of sections showing horizontal sliding, vertical pivoted and special pivoted sash, two styles of casement and steel partitions and doors. About 50 full sized sections, which are used in building up the different types of sash and eight styles of mullions are illustrated. Included in the handbook are over 30 pages of installations of this sash and the steel partitions and doors.

Grinding Machines.—Walker Grinder Company, Worcester, Mass. Circular E and pamphlet. Concerned with several types of grinding machines which have been designed for toolroom use. Practically all of the machines are illustrated and briefly described, and drawings with the various parts designated by numbers to correspond with a list are included.

Metal Working Machinery.—Blake & Johnson Company, Waterbury, Conn. Collection of circulars. Concerned with a line of presses, grinding machines, cold rolling mills and a splitting machine. In all of the circulars views of the different machines are given with a brief text description and a condensed table of specifications.

Automobile Steels.—Carpenter Steel Company, Reading, Pa. Pamphlet. Covers a line of special steels for automobile use, which include chrome-nickel, chrome-vanadium, nickel, silico-manganese, carbon and permanent magnet steels. Descriptions of the various properties of these steels are given, together with the results of tests.

Power Presses.—Zeh & Hahnemann Company, Newark, N. J. Several circulars. Pertain to a line of power presses which can be used for cutting, forming, stamping, punching, etc. These are built in the percussion, inclinable and open back types for bench or floor use. Illustrations of the various presses are shown and brief descriptions with condensed specification tables are given.

Pulleys.—Medart Patent Pulley Company, St. Louis, Mo. Several pamphlets. Describe and illustrate wood split, whole and split patented steel rim pulleys and grooved pulleys for rope transmission purposes. Mention is also made of a line of turned and polished steel shafting which is made in diameters ranging from 3/16 to 6 in. and the company's line of friction clutch pulleys.